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DESCRIPTIVE ACCOUNT OF ALL THE

PATENTS ENROLLED BETWEEN 20TH APRIL AND 20TH MAY 1830.

Particularising the Offices in which the Specifications may be inspected, with the Dates of Enrolment.

STEAM ENGINE.—To Thomas Banks, of Patricrof, Lancashire, Civil Engineer, a patent for "improvements in steam engines," was granted on the 30th of September, 1829, and the specification was lodged in the Rolls Chapel Office on the 27th of March, 1830.

Mr. Banks describes two improvements in connection with the steam engine: the first applicable to the supply of oil or other lubricating material to the piston, and the second to the supply of steam to the cylinder. With regard to the supply of oil, the method proposed by this patentee is very similar to the one patented by Colonel Torrens, and described at the 258th page of the 4th vol. of the New Series of the *Register of Arts*. The oil or melted tallow which the patentee prefers, is conveyed through the piston rod, made hollow for the purpose, to a ring situated half way between the top and bottom plates of the piston. This ring being made open towards the cylinder, which it approaches very

near to, affords an abundant and uniform supply. The tallow is introduced into the hollow piston rod by means of a vessel precisely like a tobacco pipe, with its shank stuck into its side and its mouth turned upwards for the reception of the tallow. The second part of the invention consists of a revolving pipe for the passage of the steam alternately above and below the piston, and from the cylinder to the condenser or to escape, when no condenser is used. The revolving pipe extends the length of the cylinder, and has at each end, two apertures on opposite sides, and a fixed partition twisted into half a spiral, so as to form a communication between the upper opening on one side and the lower opening on the other. On the upper end of the revolving pipe is placed a collar, through which an opening communicates on one side with the boiler, and on the other with the cylinder: and the lower end turns in a similar collar, with communications from the cylinder on one side, and the condenser on the other. Now it is evident from the position of the spiral partition, that each opening at the top is connected with the opposite opening at the bottom; and hence, as the pipe revolves, the communications are alternately opened between the boiler and one side of the piston and the condenser and the other. This is an application of the principle of the two way cock, which possesses considerable ingenuity, and may be found in some cases very serviceable.

IRON MANUFACTURE.—To Josias Lambert, Esq. of Liverpool Street, London, a patent was granted on the 4th of February last, for "an improvement in the process of manufacturing iron, applicable to the smelting of the ore, &c.," the specification of which was deposited in the Enrolment Office on the 3rd of April.

This improvement is stated to consist in the addition of various salts to the iron in its crudest state (the ore), as well as in the subsequent stages of its preparation and refinement, the furnaces and the mechanical muniputations being the same as usual. A mixture is to be made of two parts of "*salt*," one part potash, and two parts lime, and added to the iron ore in the *blast-furnace* in the proportion of 25lbs. weight to the ton of iron; but it is not *essential* to add the mixture in the first instance, if the iron required have to undergo subsequent processes; in which cases, the saline mixture may be added either in the *refinery furnace* at the rate of 20 lbs. to the ton, or in the *puddling furnace*, at the rate of 18 lbs. to the ton; but if in the *balling* or *reheating furnace*, the quantity of the mixture required will vary from 18 to 30 lbs. to the ton; but

in this as well as in other respects, there is a want of clearness in the specification. The foregoing mixture is stated to be one of the patented improvements contemplated, yet it is added in the specification, that another mixture, consisting of two parts "salt," one and a half part saltpetre, and two parts lime, are to be mixed with the iron in the puddling furnace, whether there shall have been previously added the first mentioned mixture or not. It therefore seems to follow, that when the mixture has been added in the first process, it must be only so much waste; because the improvement is equally effected, according to the specification, when the first mixture *has not* been added. From an observation made at the close of the specification, we however gather, that the potash mixture is to be used in preference in the making of that sort of iron technically called *red-short*, and the saltpetre mixture in the preparation of the *cold-short*. The quantities of either of the mixtures, will depend upon the "*degree of inferiority*" of the iron to which it is applied, and will vary from 18 to 30lbs. per ton. It is especially directed, that the salts be added to the iron in the *puddling furnace*, whilst the metal is in a state of fusion; and in the subsequent processes, when the iron is no longer fusible it is to be sprinkled over the metal when it has acquired a red heat.

Alternating from a Rotatory Motion.—To William Parr, of Union Place, City Road, Middlesex, Gentleman, a patent for "a new method of procuring reciprocating action by means of rotatory motion, to be applied to the working of all kinds of pumps, mangles, and all other machinery, in or to which reciprocating action is required, or may be applied," was granted on the 18th of January, 1830, and the specification was deposited in the Enrolment Office on the 18th of April, 1830.

The title of this patent sufficiently shows the intention of the patentee; and as he explains the nature of his invention by describing its application to a mangle, we shall follow his example, and describe at once the nature of the apparatus and its action in communicating the required alternating motion to a box mangle as they are generally made. An axis to be turned by a winch extends across the mangle near its middle, and turns in bearing attached to the exterior frame in such a manner, that it is capable of being elevated or depressed with the stone box when the materials to be mangled vary in thickness. Near the middle of this axis is fixed a bevel wheel whose teeth take into, and give motion to, another bevel wheel, with

its axis turning vertically in a bar extending across the mangle and fixed at each end into the plumber boxes in which the horizontal axis turns. Below the bar which supports the second bevel wheel and on the same axis, is fixed a pinion whose teeth communicate motion to a horizontal rack connected with and extending along the stone box of the mangle.

This rack consists of a series of cylindrical pins projecting upwards as far above the frame as the thickness of the pinion by which they are moved. Now this rack with the vertical pins or teeth has a horizontal motion across the mangle box equal to the diameter of the pinion, so that it may pass alternately along the right and left of the wheel work by which it is actuated. The lower end of the vertical axis moves in a groove along each side of the pins constituting the rack teeth, at the same distance therefrom as it is from the teeth of its pinion, and extending round each end in a portion of a circle, of which the last tooth of the rack is a centre: and this is the contrivance by which the rack is shifted from side to side when the pinion reaches its ends.

Now it will be readily perceived, that an apparatus similar to this, may be placed vertically, or in any inclined position, and applied to pumps or any other purposes, when an alternating is required to be obtained from a circular motion.

A man interested in patents as Mr. Parr seems to be, for this is not his first essay in that line, might have been expected to be acquainted with the contents of the *Register of Arts and Journal of Patent Inventions*; but this appears not to be the case, for at page 168, vol. i. of the Second Series, published in October, 1828, is described a mangle motion by Messrs. Christie and Co. of Sheffield, which is in principle precisely the same, and in details, far superior to Mr. Parr's "new method of procuring a reciprocating action from a rotatory motion."

EXPLODING SHOT.—To John Tucker of Hammersmith, Middlesex, Brewer, a patent for "an exploding shot or projectile," was granted on the 2nd of November, 1829, and the specification was lodged in the Rolls Chapel Office on the 23rd of April, 1830.

Into the hollow part of the shell is introduced a metallic tube, which likewise extends a small distance outwards, and forms a kind of tail to the projectile, which causes it to move with a particular side forwards. A small metallic cylinder is introduced so as to move freely in this tube, and at its extremity farthest from the tail is placed a portion of percussion powder. When

the projectile is filled with gunpowder, &c. in the usual way, and fired off, the loose cylinder from its inertia, or natural tendency to remain at rest, will be removed to, and continue during the motion through the air at, the last extremity of the tail tube; but when the projectile impenges against the ground or any other obstacle to stop its motion, the loose cylinder will from its inertia or tendency to continue in motion, proceed with considerable force to the foremost end of the tube, where the percussion powder is placed, and thus an explosion will instantly and certainly ensue. An exploding projectile was two years ago exhibited in the National Repository, and described in the *Register of Arts*, p. 326, vol. ii. of the New Series; but Mr. Tucker's seems less dangerous to the persons firing it, and more certain to explode when it reaches its destination.

STEAM ENGINE.—To William Church, of Haywood House, Birmingham, a patent for "certain improvements in machines for propelling vessels and other machines capable of being propelled by steam, and in boilers applicable to the same, and other purposes," was granted on the 15th of October, 1829, and the specification was enrolled in the Rolls Chapel Office on the 15th of April, 1830.

The improvements here contemplated are applicable to the supply of fuel to the fire, to the boiler, the method of opening and closing the steam passages, the whole arrangement of the different parts of the engine, and its application to propelling vessels, through the medium of propelling wheels of a peculiar description.

The fire feeding apparatus consists of a coal hopper, having at its lower extremity a small revolving roller with four vanes, which transfers the coals in small quantities from the hopper to a plate situated within the furnace doors, and somewhat higher than the surface of the fire. From this plate the coals are driven forwards, and scattered over the fire by a projecting rake, which fills the aperture through which it passes, having on its upper surface a flat plate extending under the hopper when the rake is driven forward, and thus communication with the air is prevented. The rake is actuated by the engine through the medium of a series of levers.

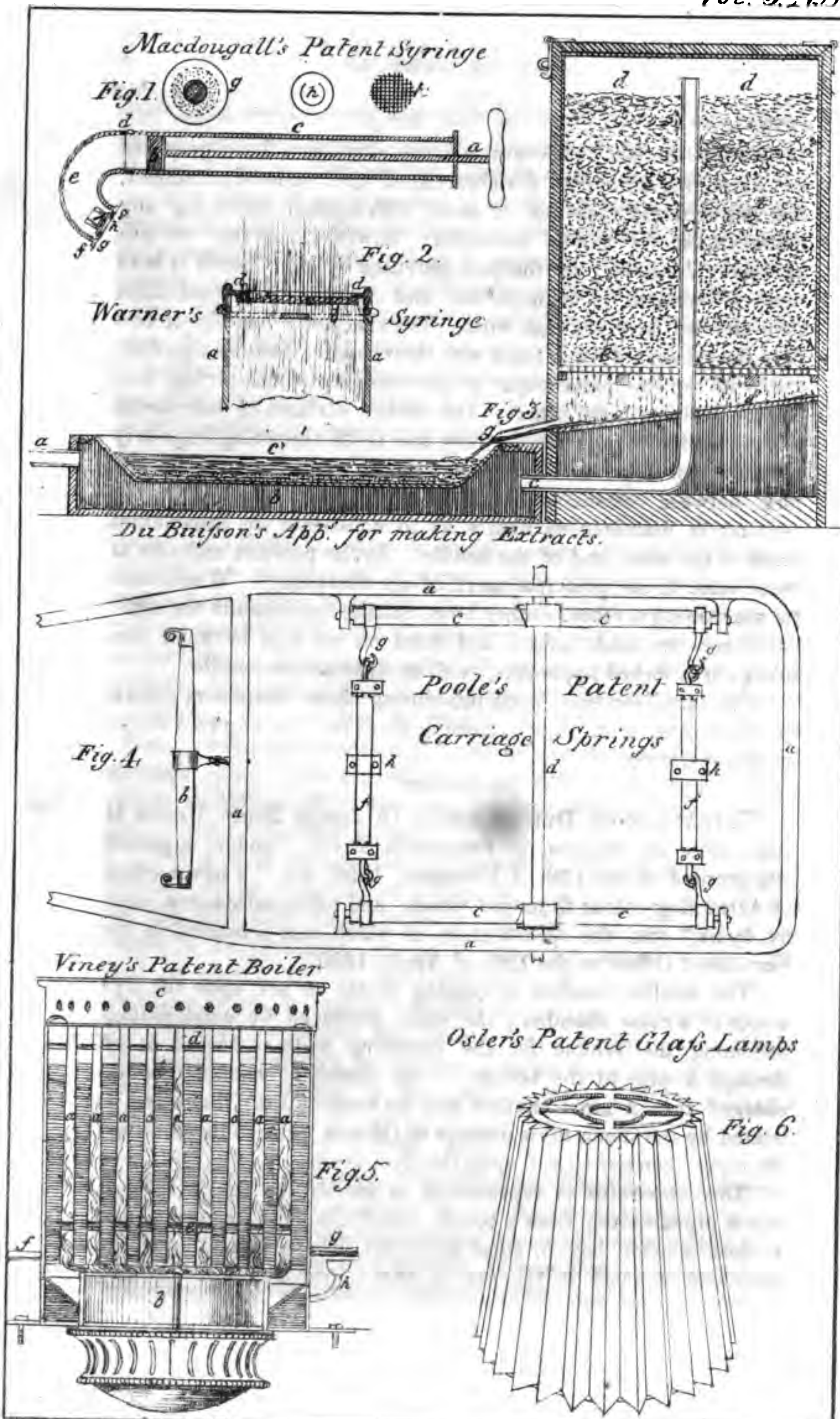
The boiler proposed by Mr. Church is of the tubular kind, on the principle introduced by Mr. Mc. Curdy, in which the fire is made to ply round the tubes, with a peculiar arrangement of

connecting pipes proceeding from the upper part of one tube to nearly the lower part of another, according to its elevation: by this the quantity of water and steam in each is regulated.

Two plans of opening and shutting the steam passages are described. In the first the steam is admitted into the cylinder, and permitted to escape from it through holes in its top and bottom plates, by means of additional plates with smaller holes, which are alternately brought opposite the holes communicating with the cylinder, the boiler, and the condenser. The cylinder is furnished with a jacket or steam chamber, extending above and below as well as round it. The exterior top and bottom plates are made by means of a crank motion to oscillate, and thus the communications between the cylinder and boiler, and cylinder and condenser, are alternately opened and closed. A plan similar to this was introduced eight or ten years ago by Mr. Jacob Perkins, who caused his communication plates to rotate instead of vibrate. A second plan of opening and shutting the steam passages is described to consist of two flap valves placed in a pipe which communicates with the boiler at one end and the condenser at the other. A communication is opened from the top of the cylinder and the space between the valves, which are joined by a connecting rod, so that the motion which opens one shuts the other, and the upper part of the cylinder is constantly in communication either with the boiler or condenser. A similar set of valves and pipes effect the same thing between the lower part of the cylinder and these vessels.

The method of propelling proposed by this patentee consists of two sets of vanes placed obliquely, like those of a windmill, on the same axis which is to be parallel with the keel of the vessel to be propelled, one set of vanes are sloped to the right and the other to the left, and they are made to turn by an intermediate wheel in opposite directions, that the oblique force of the one may counteract the oblique force of the other. These propelling wheels are incased in a large open cylinder, which prevents the agitation of the water escaping from the oblique vanes.

Sharpening Knives.—To William Church, of Haywood House, Birmingham, a patent for "certain improvements in, on, or upon, instruments for sharpening knives and other edged tools, and in the machinery or apparatus for manufacturing the same," was granted on the 15th of October, 1829, and the specification



L. Hebert

June 1830

was enrolled in the Rolls Chapel Office on the 15th of April, 1830.

Within the last two years so many plans have been proposed for sharpening knives by the abrasion of steel variously modified, that we scarcely expected to meet with another possessing any claims upon the public attention: however, in this we are agreeably deceived; for the plan patented by Mr. Church is both more economical in manufacture and convenient in application than any we have yet met with. The sharpener consists of two very flat truncated cones fixed with their smaller surfaces together, and with several rectangular projections in the one fitting into similar cavities in the other. The conical surfaces of both pieces are serrated with a series of very fine teeth extending angularly towards their centres. These are placed upon the shank of the fork, between the shoulder and the handle, with which they correspond in diameter so nearly as to constitute an ornamental finish to the small end of the handle. In the position and size of these consists the principal merit of the sharpener. When used for sharpening scythes or other large cutting instruments the conical pieces are made larger, and fitted on an axis between two prongs of a forked apparatus, with an appropriate handle.

The improvements in manufacturing these sharpeners consist in the application of dies for forming them into the required shape at one operation.

EXTRACT FROM DYE WOODS.—To Joseph Marie Ursule la Rigaudelle du Buisson, of Fenchurch Street, London, a patent was granted on the 12th of February, 1830, for "a new method of extracting colour from dye woods, and other substances, used by dyers," and the specification of which was deposited in the Enrolment Office on the 12th of April, 1830.

The method consists in causing steam to act upon the dye woods in a close chamber; the water produced by condensation becoming the vehicle for the colouring matter, carries it off through a pipe at the bottom of the chamber, whence it is discharged into a large shallow pan for evaporation; this vessel is heated by the steam in its passage to (that is, prior to its entering) the close chamber to act upon the dye woods.

This apparatus is represented in section, by fig. 3, Plate I. *a* is a pipe leading from a boiler, which conducts the steam into a close wooden box *b*, lined with lead, where it acts upon the decoction of wood in the pan *c*, above, previous to its entering

the pipe *c c* to the top of the wooden chamber, which is lined with earthenware, or glazed tiles, and made steam tight at the joints when closed down. The dye wood (reduced to chips or saw-dust) intended to be represented at *d d*, is thrown into this chamber, upon a perforated bottom *e e*, and filled to within ten or twelve inches of the top, The steam as it descends among the wood, becomes condensed, and the water charged with the colouring matter trickles through the perforations in the bottom, whence falling upon an inclined plane it immediately runs off through the pipe *g* into the evaporating pan, where the fresh steam constantly acting upon it, reduces the extract to the required consistency. When the liquid from the dye wood runs colourless, it is known that the extraction is complete. A small pipe is fixed in the bottom of the box *b*, to draw the water that may be formed there by condensation. If the colouring matter required to be extracted is combined with resin, the vapour of alcohol, or other proper menstrua, must of course be used instead of water, the process being in all respects the same, except that the vapours of such valuable liquids should of course be ultimately condensed, instead of allowing them to escape from the evaporating pan.

This apparatus appears to us, in every point of view, to be admirably adapted to its object.

NEW CARRIAGE SPRINGS.—To Moses Poole, of Lincoln's Inn, Gentleman, a patent was granted "for a certain combination of, or improvement in, springs applicable to carriages and other purposes." Communicated by a foreigner. Dated Feb. 27, 1830, and the specification was enrolled on the 26th April, 1830.

These springs are upon a totally different principle from those in general use, and seem to us to be well deserving of a fair trial. The action upon, and reaction of, common springs, is produced by expanding or contracting them in the direction of their length; but the action and reaction of these patent springs is effected in the direction of their breadth, *twisting* and *untwisting*; requiring thereby a much greater quantity of force to produce the effect; and in consequence less of steel or other material becomes necessary; the form required is besides of much simpler and easier construction.

In the drawing accompanying the specification, is shewn the application of a set of springs of this description to the carriage of a stanhope, a copy of which is given in our Plate I. fig. 4. *a a a* is the frame of the stanhope, *b* the splinter bar; *c c c c* are

two long single plates of steel; these plates are twisted in a slight degree, so as to give them a spiral direction, but in contrary ways, proceeding from their middles, where they are made fast to the axletree *d*, by means of strong clamps *e e*, which hold them in an inclined position of 45 degrees; the extremities of each of these plates have a small projecting axis, which turns in a bearing bolted to the side frame of the carriage. These plates being thus fixed in their middles, can be twisted by a due force applied to the ends; but this force (which is the weight of the carriage) is applied through the medium of a second pair of torsion plates *ff*, attached to the first, by curved bars or arms *g g g g* fixed at the extremities of the plates and hooking into each other. The plates *ff* are fastened at their middles to the underneath part of the body of the carriage, by clamps *h h*, which place them in a similar angular position to the first mentioned, and the ends turn in the same manner as the others in bearings *i i i i*, also fixed to the bottom of the carriage.

A little consideration of this arrangement will shew, that the body of a carriage thus suspended, will possess a considerable degree of elasticity; but experience alone must determine their real advantages and economy.

SALT-MAKING.—To John Braithwaite, and John Ericsson, of the New Road, London, Engineers, a patent for "an improved method of manufacturing salt," was granted on the 27th of February, 1830, and the specification was enrolled in the Petty Bag Office on the 26th of April last.

The object these patentees have in view, is the manufacture of better salt with a less expenditure of fuel; which they propose to effect, by heating the brine considerably above the boiling point, before any evaporation is permitted to take place. This is done by confining the brine while heating, in a close boiler, and then permitting it to pass from a pipe of large dimensions extending considerably above the top of the boiler into a shallow evaporating vessel, where the process goes on till it ceases from the reduction of the temperature; when the brine is conveyed to the boiler, entering at the bottom, and again heated: and thus a circulation is kept up on the principle of the methods which we have recently described for communicating heat by the circulation of hot water. The lower end of the pipe which extends from the top of the boiler is enlarged for the reception of a pair of vanes, fixed on a vertical axis extending through a stuffing box at the top, where a

pulley is attached to communicate motion to the vanes, by which, according to the patentees' statement, the circulation of the fluid is promoted. The brine is made to pass through a deep vessel with a vertical partition before it enters the evaporator, and through another on its return to the boiler. The evaporator is a long vessel of the form of a parallelogram; and a vertical partition extending from the end next the boiler to within a small distance of the other end, causes the fluid to pass along one side and return by the other.

As the water evaporates, the salt is deposited on the bottom of the evaporating vessel, and is removed therefrom by scrapers in the usual manner. The principle advantage of this arrangement, is the entire removal from the fire of the surface on which the salt is deposited; and consequently, the formation of pan-crust or scratch-salt is completely prevented; for as no evaporation takes place in the boiler no salt can be deposited there. There are a set of covers for diminishing at pleasure the evaporating surface, by which the fineness of the crystals of salt can be regulated with the greatest facility.

This arrangement evidently contains many advantages as far as regards the quality of the salt; and when it is considered, that the heat communicated to the brine can only escape by evaporation, as the shallow vessel is made of non-conducting materials, its economical application will likewise be found an inducement for its general introduction.

BATHS.—To William Gooch, of Mount Street, Berkley Square, London, a patent "for certain improvements in baths of different descriptions, which improvements are applicable to other purposes," was granted on the 7th of November, 1829, and the specification was lodged in the Enrolment Office on the 7th of May, 1830.

A shower bath, a vapour bath, and a plunge bath, have been generally made separately; but to save room and expenses, Mr. Gooch proposes to make one apparatus answer the purpose of all three. To a long trough precisely of the form usually employed for warm bathing, is connected a steam pipe supplying steam from a boiler not described. This steam pipe conveys the steam into two steam perforated chambers in the bottom of the trough through which the steam escapes into the bath; the supply being regulated by a stop cock whose handle is elongated so as to be within reach of the bather when standing upright. A cloak of

calico or other suitable material is made to draw round the bather's neck and to hang over his feet, to prevent the escape of steam. The cloak is suspended from a bracket extending from an upright shaft; which also supports suspended from a second bracket the vessels for the shower bath.

The apparatus constituting the shower bath part, consists of a cylindrical vessel open at one side, and supported on an axis within another vessel with a perforated bottom; and by turning the cylindrical vessel half round, the open part is brought downwards, and the water escapes through the perforations in the bottom of the second vessel in the form of a shower. When the shower bath is employed, the cloak is raised higher, and the opening at the top extended to admit the water upon the patient.

Mr. Gooch does not pretend to have invented the particular form which he describes, of any of the baths separately, but he claims the arrangement of parts by which all three, or any two of them can be combined—by which he contends, that much room and considerable expense will be saved to persons requiring more than one of these important appendages to health and comfort.

Ships' Scuppers.—To John William Dodgson, of Lower Shadwell, Middlesex, Pump and Engine Maker, a patent for "certain improvements in ships' scuppers, and which may be applied to other purposes," was granted on the 17th of November, 1829, and the specification was deposited in the Enrolment Office on the 12th of May, 1830.

This invention consists in the application of a folding valve made of metal or any other suitable material; but such metal as is little subject to corrosion from sea water is preferred for sea service. The valve is hinged at the top, and provided with a counterpoise above the hinge to keep it closed, when the vessel heels over on one side: it opens outwards, as represented by fig. 5, Plate II, to permit the escape of water from the deck, but closes to prevent the admission of water from the sea through the scuppers.

Cutting Marble, Wood, &c.—To Joseph Gibbs, of Crayford Mills, Kent, Timber Merchant, a patent for "improvement in machinery for cutting marble, wood, and other substances," was granted on the 12th of November, 1829, and the specification was lodged in the Enrolment Office on the 12th of May, 1830.

Machinery for carving marble, wood, and other substances,

would better designate the invention before us, as it consists in an arrangement by which any design may be cut out on the marble, &c. by a series of rotatory cutters, effecting their operation in a manner similar to that employed by the seal engravers; with this difference however, that while the seal engraver brings the different parts of the substance to be cut successively against a revolving cutter which does not change its place, Mr. Gibbs keeps the substance to be cut stationary, and moves the revolving cutter in succession over the places to be excavated. The universal motion of the revolving cutter is very ingeniously obtained through the medium of three sets of band wheels fixed into a moveable frame. The first motion, obtained from steam, water, or animal power, is applied to a pair of band wheels turning together loosely on a fixed axis, and from this it is conveyed to a second pair of similar wheels situated at the extremity of two levers framed together and turning on the same axis with the first pair of wheels. The motion is thence conveyed to a cutter of the drill kind, situated at the extremity of a second pair of levers which are framed together as the first, and which turn on the axis of the second pair of wheels. Thus a horizontal motion in every direction is obtained, without at all interfering with the circular motion of the cutter.

The substance to be cut is placed, or rather firmly fixed horizontally on a table, and over this is placed on a second table a pattern block with the design to be engraved. Now from the last pair of levers a bracket or arm extends over the second table and carries a tracer in a vertical position precisely over the cutter; and through this means the design may be faithfully transferred to the block on the lower table. The cutters are made of various forms according to the work to be done, and the point of the tracer must correspond in form with the cutter.

The whole of this arrangement is very ingenious, and well calculated to effect the purpose which the patentee has in view, while some of the motions introduced are susceptible of application to other useful purposes.

Chandeliers.—To Thomas Osler, of Birmingham, Chandelier Furniture Manufacturer, a patent for "certain new improvements in the construction of glass and metal chandeliers, and other articles for ornamental lighting," was granted on the 10th of November, 1829, and the specification was lodged in the Enrolment Office on the 10th of May, 1830.

The splendour of the chandelier ornaments being dependant upon the refraction of the light by its passage through glass of different degrees of thickness, and its reflection from surfaces differently situated with respect to each other, the chandelier makers have hitherto devoted their principal attention to increase the number of refracting angles and reflecting surfaces, without paying much regard to their form, magnitude, or position, with respect to each other: hence the most advantageous effect could scarcely be expected from any given quantity of material and workmanship. Mr. Osler has, however, experimentally investigated the subject, and found that triangular or square prisms with larger surfaces placed uniformly in circular rows greatly improves the splendour: and he has invented and patented several ingenious methods of manufacturing and connecting together, prisms of this description. He prefers the circular or conical arrangement such as that represented by fig. 6, Plate I. The exterior edge of each prism is cut away at the top and bottom, leaving a projection on the interior which fits into a circular grove in a top and bottom ring by which they are connected and kept together. When light is to be placed within the circle or cone of prisms, the top and bottom rings are attached by wires extending from the one to the other near the glass; but when light is not to be placed within the circle, a bar extends across each ring, and they are joined together by a rod extending up the centre. A notch is cut from the exterior to the groove in the ring for the admission of the prisms, which are passed round in succession. These are secured in their places by plaster of Paris or other cement.

We cannot conclude, without expressing our unqualified approbation of the clear and methodical manner in which the patentee has drawn up his specification; it furnishes quite a contrast to the unmeaning jargon of the legal phraseology with which the greatest part of these documents abound.

Horticultural Syringes.—To Daniel Macdougall, of Edinburgh, Horticulturist, for "certain improvements on, or additions to, syringes applicable to garden and other purposes," a patent was granted on the 10th of November, 1829, and the specification was deposited in the Enrolment Office on the 10th of May, 1830.

The present patent affords another instance of the many we have at various time noticed of the heedlessness with which inventors take out patents; or of their lamentable want of discrimination in selecting persons to pass their patents who have no knowledge of what has been already done in the mechanical world, and who will not be at the pains of searching out their exact nature and extent.

The syringe which is the subject of this patent is represented by the sectional sketch fig. 1, Plate I. *a* and *b* are the rod and piston of a cylinder *c*, having a screwed joint at *d* to which a curved piece *e* may be attached or detached at pleasure: at the extremity *f* is situated the perforated plate *g*, called the rose head; and in the centre of this is a small thin leather flap valve *h*, which is kept from protruding internally, by the interposition of a piece of wire-gauze between the outside plate and the valve; the wire-gauze serving also to prevent gross matters from entering with the water into the syringe; and the valve is kept internally in its place by one end of a short piece of tube screwed against the circular piece of leather just within its periphery, so as to allow the flap of the valve to open freely within the piece of tube. These parts are also shewn in plan by separate figures, distinguished by similar letters to those in the section: *k* is the piece of wire-gauze.

The patentee rests his claim to novelty and patent right to the invention of the valve in the centre of the rose-head, by which he states, that he obviates the difficulty experienced from the reaction of the air in working common syringes, when drawing the piston back to take a charge of water, as the latter cannot from the diminutive size of the apertures it has to pass through, fill up the vacuous space left between it and the piston, sufficiently rapid. The introduction of a valve therefore, to allow the water to follow the piston freely, is good, and the construction of the valve itself is not without merit; but it is much to be regretted that Mr. Macdougall was not informed that valves were so applied years before him. A valve in the centre of the rose-head is used by Mr. Read, in his patent horticultural syringes, although it is a valve of a different kind (for which, see our account of the National Repository in the present number); we also have seen some excellent horticultural syringes manufactured by Messrs. Warners',* of Cripplegate, on which the rose-head is in itself a valve, which renders the apparatus infinitely simpler, more durable, and not so likely to get out of order; and in consequence

* We have given a little diagram of this rose-head, &c., by way of explanation, at fig. 2, Plate I. *a a* being the section of a portion of the cylinder barrel, the end of which *b* shewn by dots, is cross bars; *c* is the perforated plate or rose head, having the space between *b* and the rim *d d* to play in. On taking a charge of water, the plate *c* of course is pressed back against *b*, the water passing not only through the perforations, but all round its periphery; affording thereby such a volume of water as to fill the cylinder almost immediately; and in forcing out the water into the syringe, the plate is of course pressed against the rim *d*, and the water can only escape in minute jets through the perforations.

of this simplicity, the price is, we believe, only half that of Mr. Macdougall's.

Machinery for Making Bricks.—To John Cowderoy, of Britannia Street, City Road, Gentleman, a patent for "certain improvements in machinery for making bricks," was granted on the 2nd of November, 1829, and the specification was enrolled in the Petty Bag Office, on the 1st of May, 1830.

The patentee describes his brick making machine to consist of a series of cast-iron moulds, constructed with sides and ends which fold back, to facilitate the delivery of the bricks after they have been formed by pressing the brick earth into the moulds. These moulds are formed into a kind of chain by being jointed together at their ends; and this chain of moulds is carried over two drums or pulleys, which being put in rotation, bring the moulds in succession under the brick earth hopper to be charged, under a pressing block which is actuated by a crank to condense the earth into the moulds; then they pass under a stick or scraper to clear away the superfluous mould and smooth the upper surfaces; and finally, they are brought over transferring boards, by which they are conveyed to the barrows and taken to the drying ground. The moulds are likewise brought over a wheel furnished with the series of sponges on its periphery, which pass through a trough of water below the wheel, and thus receive a supply sufficient to moisten the brick moulds. Besides these there is an apparatus for supplying sand to the moulds, though the patentee confined his claim to the introduction of cast-iron moulds with folding sides, jointed together in the form of a chain.

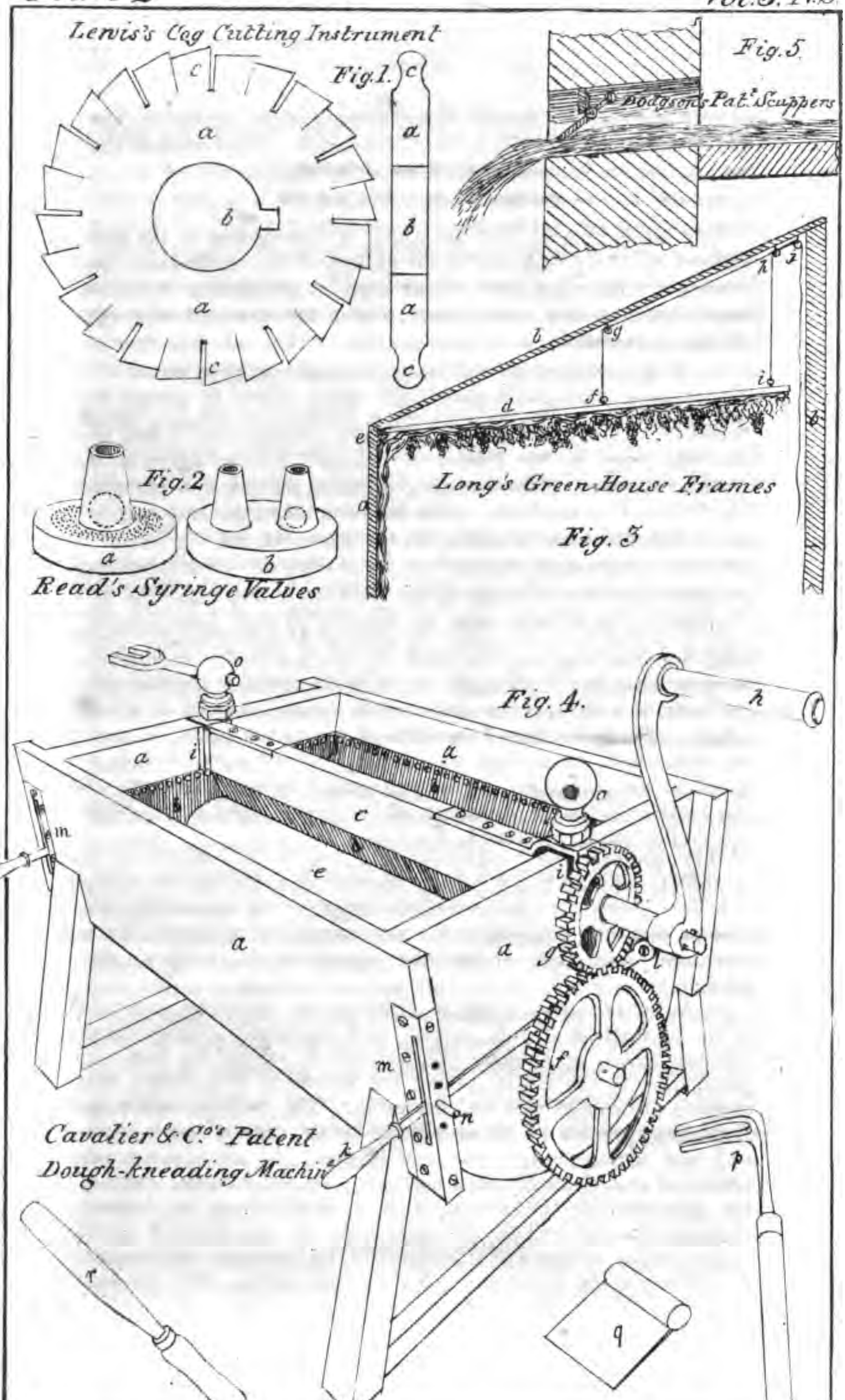
Steam Boilers.—To James Viney, of Piccadilly, Colonel in the Royal Artillery, a patent for "certain improvements in steam boilers, and in carriages or apparatus connected therewith," was granted on the 2nd of November, 1829, and the specification was deposited in the Enrolment Office on the 2nd of May, 1830.

The "certain improvements" specified by this patentee consist of a boiler made up of a series of tubes placed in succession within each other. The difference between the diameters of the tubes is such as to leave annular spaces between them. The tubes are made somewhat conical, and they are placed alternately with their wide and narrow ends upwards, so that the spaces between them alternately taper towards the top and bottom. Those spaces which taper towards the top, represented in section by *a a a*, &c. fig. 5, Plate I, are open at both ends, and used as flues for the passage of flame, smoke, &c. from a lamp *b*, attached to the bottom of the apparatus;

and the spaces which widen towards the top are closed at both ends and used to contain water and steam. A communication *d* is introduced for the passage of steam from one space to another, and a communication *e* serves for the passage of water from one space to another. *c* represents a series of openings for the escape of smoke and to produce a draft through the flues. *f* is a pipe for the supply of water to the boiler. The steam descends in the outermost annular space from the top of the boiler to the steam pipe *g*, which communicates with the engine. The oil reservoir of the lamp is supplied by the funnel shaped vessel shown at *h*. We have only described one of a series of boilers which the patentee proposed to employ when much power is required; and these he arranges in a circular position, or any other which may be found most suitable to the space to be appropriated to the boilers of steam carriages, the propelling of which seems to be his principal aim.

The advantages contemplated by this arrangement are the great extent of surface exposed to the heat and the portability of the sources by which the heat is obtained, as the lamp is small compared with a furnace, and oil is light compared with other fuel to produce the same heat. It will be readily perceived that this does not possess the strength of a tubular boiler, as all parts will necessarily be subjected to the same degree of pressure, and the exterior vessel must, from its size, be regarded rather as a cylindrical than a tubular boiler.

The foregoing is what Colonel Viney describes as his invention; but he claims in addition the doing away with the use of separators and blowing machines in steam carriages. With respect to the first of these extraordinary prohibitions, we leave Mr. Gurney, who uses separators, to contest the point with the gallant Colonel. But we are really sorry that the King should have granted his letters patent for the doing away with blowing machines in steam carriages, as we had in contemplation the introduction of a machine of this kind, which might have proved very advantageous to his liege subjects. Still, if it should turn out as we suspect, that his Majesty granted this patent while labouring under the indisposition with which he is at present afflicted, he may be, on proper representations, induced to reverse his decision, and grant us a patent for our improved blowing apparatus.



L. Hebert June 1830.

NATIONAL REPOSITORY,

FOR THE EXHIBITION OF IMPROVED WORKS OF ART,

CHARING CROSS, LONDON.

Continued from p. 278, Vol. IV.

We resume our task of furnishing a description of the novel productions of art exhibited in the gallery of this institution; and commence with a machine, constructed for performing in a more cleanly manner then is customary, one of the most essential operations; it is called

The Petrisseur, or mechanical Bread-Maker.

The invention is the subject of a French patent by Messrs. Cavalleir and Co. of Paris; an English patent for it has also been taken out by Mr. Poole, of Lincoln's Inn, as agent to the French inventors. The former gentlemen published a pamphlet descriptive of the machine, which has been translated into English, and is intended to accompany the machine, for the instruction of purchasers in the application of it; but it happens that the machine therein described, differs in several respect from that exhibited in the Repository, and the English translation of the French description is (owing to the difficulty perhaps of converting technical terms from one language into another), not intelligible in some apparently essential particulars; so that by reading the pamphlet one obtains only very imperfect and confused notions of a very simple machine. Instead therefore of giving the plans, sections, and elevations, of another modification of the apparatus as inserted in the pamphlet, we have judged it best to give our own perspective sketch of the actual machine exhibited in the Repository, for which, see fig. 4, Plate II.

The preface (or "advertisement" as it is called) to the pamphlet, contains the following observations, the last paragraph of which appears to us extremely singular, as emanating from persons who pay large sums for the purpose of monopolizing an invention, and then invite the ingenious to destroy their monopoly:

"As every human being is directly and indirectly interested in the production of good, cheap, and especially *cleanly* manufactured bread, no apology will therefore be offered for thus communicating to the British public the means of obtaining a combination at once so rare and desirable. The truly barbarous and disgusting process of bread-making by the *naked* hands, arms, and, not unfrequently, even *feet* of men, has already too long prevailed among all civilized nations. To the French, mankind are indebted for the invention of a desideratum in domestic economy namely—THE PETRISSEUR, or *mechanical* bread-maker.—The adoption of this ingenious and valuable improvement in machinery, as a substitute for manual labour, will no doubt

soon become popular in England, where every thing useful, however foreign its origin, or simple in design, is immediately and duly appreciated.

"It must first however be made generally known; to promote which is the chief object of this little translation.—A second, is to stimulate others to make such further improvements in the invention as it may be found susceptible of receiving. For this purpose a small machine will be deposited as a model, in the National Repository, King's Mews, Charing Cross; where all may have an opportunity of seeing, studying, or examining its construction, &c. It is now only necessary to state here, that every advantageous suggestion or modification, foreign or domestic, which may be made in the Petrisseur, shall, from time to time, be superadded to this unpretending but useful little work; in the hope that every public establishment and private family in the empire may not only patronize "*Pain a la mechanique*," but also, have their Petrisseurs manufactured at the lowest expense on the best principle, and under their own direction."

a a a a, (fig. 4, Plate II.) represent a strong wooden trough nearly square, but tapering downwards a little into a less area, and having a curved or semi-cylindrical bottom; the lower part of this trough is lined with sheet-iron, as shewn at *b b*; and it is divided longitudinally by a vertical partition *c*. The lower edge *d* is reduced to an acute angle, and covered with iron, to form a scraper to the surface of a hollow cast-iron cylinder *e*, which is made to revolve underneath it; for this purpose, the axis of the cylinder *e*, after passing through the side of the trough, carries a spur wheel *f*, which is put into motion by a pinion *g*, when operated upon by a winch *h*. At *i i* are, what are described by the inventor, as "bags or seats, they extend downwards, so as to close the vertical jag or notch which is formed to receive them at each extremity of the trough."—"These pieces (are further stated to) have two cheeks in the interior which serve to keep the scraper sideways."

The bearings of the toothed wheels *f* and *g*, are formed in an upright bar at each end of the trough, and they are connected by the same to the vertical partition *c d*, so that when it is necessary to increase the space between the roller and the curved bottom of the trough where the dough is formed, the handles *k k* of two levers of the second class are lifted; which being connected near to their fulcra (one of which is brought into view at *l*) to the upright bars before mentioned, raise the roller, the scraper, and the toothed gear altogether, to any height within the range shewn by the slot mortices *m m* through which the levers pass, and they are fixable at any required height, by means of a bolting pin *n* which passes through the levers, and the morticed iron frame *m m*. To adjust the scraper *c d* to the roller *e*, screws of the ordinary kinds used for that purpose are employed; these have globular heads, with holes through them, as shewn at *o o*, for the reception of a

pin key, by the turning of which the scraper is brought parallel to, and set at any required distance from the cylinder: the whole apparatus is supported upon strong wooden legs and cross-bars, as represented in the drawing.

The manner of proceeding to make bread by this machine, by the use of leaven, as practised in France, is the only mode described in the pamphlet before alluded to; but the fermentable matter employed, whether yeast or leaven, is a matter of indifference as respects the use of the machine. The required quantity of flour, yeast, and water, or other ingredients used by bakers in the preparation of bread, are to be well mixed in the trough by means of the rake (as shewn at *p* in the figure), and the kneading is then to be commenced, by causing the mixture to be forced under the cylinder in the trough as it is turned round by the winch. When all the dough has passed from one compartment to the other, the winch is to be turned in the opposite direction, by which the dough will be returned into the first compartment; and thus the dough is to be alternately forced from one side of the roller to the other by changing the direction of the motion until the operation of kneading is perfected.

Previous to commencing the turning of the roller, it should be raised to its highest limit by the levers before mentioned, and as the operation proceeds, be successively lowered from hole to hole, where it is fixed by the pin *n* until it arrives at the lowest degree, where the passage between the cylinder and the circular bottom being very narrow, the dough should be sufficiently yielding to pass under it without great force being necessary.

"If, in the course of the first turns of the roller, the dough appear too soft, add as much flour as will prevent the necessity of using more afterwards. Too much confidence must not, however, be placed in first appearances; because later, it acquires more solidity than might at first be expected."

The quantity of flour should be calculated with all possible correctness; but care should be taken that there should be a deficiency rather than an excess, it being preferable to have to add flour, than water.

The flour is recommended to be spread with the small boards, so as to form an even surface on both sides of the machine. These boards are provided by the patentees, also a hand scraper *q*, and a flexible knife *r* shewn in the figure.

"The operation of wetting, is made by sprinkling the dough over with water, by means of a brush, taking care to turn the roller at the same time; because, by thus constantly presenting a new surface, every part of the dough becomes equally damp. For the purpose of withdrawing the dough from the trough, it may be taken upon the roller as it comes in large pieces against the scraper. Each piece is put into a common basket, whence it is taken to be formed into loaves, &c.; but this mode is only adopted where the machine is in a different situation from the bake-house,

and where the weighing cannot take place. In the contrary case, the dough is left for preparation in the compartment in which the last turn of the roller has lodged it, and from which it is gradually taken away to be weighed; an operation that may be performed on the cover or lid of the trough itself, (which we have inadvertently omitted in the drawing). It is easily conceived, that if only one ovenful were to be made, or if, according to the method of some countries, a particular leaven were to be used for each ovenful, there would be no need of preserving a leaven which was not to be employed. It is likewise to be observed, that the baker who possesses any knowledge of the flour he makes use of, and the bread he wishes to make, can easily regulate, by the mere inspection of the dough, the number of turns necessary to obtain a favourable result from the roller. Nor is it less worthy of remark, that towards the end of each turning, that is, when one side of the trough is on the point of being emptied, it will be always necessary to scrape, once with the hand-knife, the dough adhering to the partitions, and cast it, together with that which remains stationary at the bottom, under the roller, while revolving.

"The use of water rather warmer than usual is particularly recommended in order to raise the temperature of the roller; it being a good conductor of caloric or heat, it easily places itself in equilibrium with the ambient air. In winter this precaution is indispensable If notwithstanding this recommendation of adding rather a smaller, than a larger quantity of flour after diluting, it should be perceived that the dough is too firm, and that employment of more becomes necessary, it should be done by sprinkling the dough equally with a brush, as already directed and explained. As to the other parts of the process—namely, the quantity and degree of fermentation, and the space of time during which the dough is left to rise, they are to be conducted according to whatever system choice or locality may have established.

"It should not however be overlooked (says the patentees,) that by the Petrisseur, or dough-kneading machine, the flour is better and more equally blended; and that each particle is placed in immediate contact with the water. Hence it not only imbibes all the water that is susceptible of absorbing, but requires more than mere manual labour could communicate to it. In this respect also, the baker can easily determine the necessary increase.

"In short, the kneading of dough by the mechanical means under consideration, differs only from the ordinary process by being more *perfect*.

"For instead of blending flour by the uncertain and unequal arm of man, the uniform and steady action of the roller is substituted for that desirable purpose.

"Thus it rests with the baker's discernment to avail himself of the many advantages derivable from a machine which is in itself at once simple and ingenious. For it must be evident to all, that

every requisite for the making of dough is combined in this piece of mechanism;—such as the renewal of the surfaces, the action of the air, the equalization of the particles, &c. &c."

Defensive Dress against Fire, by the CHEVALIER ALDINI.

THIS protection, which enables the wearer *(as has been repeatedly demonstrated by public experiments)* to approach with impunity, or even to pass through, a fierce flame, to rescue lives or portable valuable property, or to use means for the extinction of fire, consists, of an exterior light armour of metallic gauze, which fabric was discovered by Sir Humphrey Davy to be impervious to flame, and of an inner covering, of a material which is a slow conductor of heat. Amongst flexible fibrous substances capable of being spun and woven into tissues, the *asbestos* possesses pre-eminently the property of slowly conducting heat; but the other fibrous matters in common use for the purposes of clothing, such as wool, flax, &c. may, by immersion in certain saline solutions, be rendered very imperfect conductors, so as to fit them very sufficiently for preventing the transmission of injurious heat to the body, during a temporary exposure of some minutes to the action of flame on the outward covering of wire gauze. This dress was manufactured under the direction of Mr. Toplis, (the lecturer on natural philosophy), who has given much of his time in promoting the laudable object of the inventor.

Instrument for cutting Cogs of Wheels, with specimens of work performed thereby. By Mr. FRANCIS LEWIS, *of Trafford Street, Dean's Gate, Manchester.*

THIS Cutter (of which a plan and section are represented at fig. 1, Pl. II.) is one, amongst a thousand, of the accurate and effective tools now in common use, in the fabrication of machinery, in the great manufacturing district of Lancashire. Amongst the mechanical arts there is none, perhaps, which has made such important improvements within late years as the art of machine-making. Tools and engines are now so correctly constructed, and mechanical power so judiciously and so efficiently directed in the use of them, that, in the manufacturing machines, precision of motion, accuracy of adjustment, and solidity with lightness of structure, have now almost universally supplanted irregularity of action, mal-adjustment of parts, and feebleness and clumsiness of construction. Hence a vast economy of power and of cost—in the superior productions of the carding-engine, the spinning-frame, and the loom. As an instance, in one case of the alleged superiority of the present day in the art of machine-making, Mr. Lewis states, that the cutter here exhibited, cut in his engine the accompanying cast-iron wheel in thirty-one minutes; and that consequent on the accelerated and accurate process of its

manufacture, such a wheel can be afforded, including casting, boring, turning, and cutting, for 4s. 6d. The wood model of a wheel also exhibited was finished by the cutter in eleven minutes. The same engine will cut a bevil or spur wheel, 12 feet diameter, 12 inches deep on the cog, and 2½ inches pitch, of any form, in 15 hours. A wheel of the same dimensions would occupy a man, to pitch and trim it, seven days.

Model of an improved Hot House. By Mr. John Long, *of No. 2, Beaufort Place, near Battersea Bridge, Chelsea.*

This improvement, which is applicable to hot-houses, green houses, and conservatories, consists of *movable* wire trillis frames, to which the vines being trained, may at pleasure have their positions varied to avoid the effects of frost, or the too powerful influence of the sun's rays. In explanation of this arrangement we have given a diagram at fig. 3, Pl. II. which may be considered as a sectional outline of a hot-house of the kind; *a* being the vertical front windows, *b* the inclined roof of framed glass, and *c* the back wall; *d* represents the moveable wire trellis frame, suspended at *e* by hinge joints (formed by hooks and eyes), which is raised or lowered to any desired angle by means of cords and pullies, as shown at *f g h i j*. The temperature may by these means be in a great measure regulated, and the effects of a frost over night guarded against, by a *gradual* exposure to the influence of the sun on the succeeding day. Mr. Long states, that a considerable saving of fuel is effected by this plan, and that a plentiful crop of grapes in the highest state of perfection, is thereby secured at a trifling expense.

A Keyless Watch. By Mr. J. Brown, 27, *Glocester Street, Clerkenwell.*

In our second volume (New Series), p. 4, we have given a description of the ingenious invention of Mr. Anthony Berrollas, of a watch that is wound up without a key by means of a chain passing externally to the pendant. Whether the present modification introduced by Mr. Brown is an improvement upon its precursor or not, we must leave to more competent judges to determine. We have not had an opportunity of making any illustrative drawings of Mr. Brown's movements, and must content ourselves with adding the following description from the catalogue of the exhibition.

It is wound up by moving the bezel or rim of the case, by the finger and thumb, from left to right, until the winding is completed. If it be a fuzee watch, the bezel must be returned in the opposite direction, in any case not exceeding half a turn. The milled head at the top of the pendant, being drawn out a little and twisted, serves to set the watch to time; and it may be

regulated by a a small point projecting through the edge of the case, whose motion governs that of an index traversing on a graduated arc on the face of the dial. By these contrivances the necessity of opening the watch, either for winding, setting, or regulating, is obviated,

Specimen of Chiutz Modelling on Earthenware Jars. Executed by Miss PEARE, *Notting Hill, Kensington.*

THIS is a refinement of the art which, for the last few years, has afforded exercise for the taste and ingenuity of some of our fair countrywomen, namely, that of converting to ornamental purposes the large unglazed jars which serve as packages for importing the grapes of Spain and Portugal. In the present instance, considerable relief is given to the printed or painted figures applied to the surface of the earthen vase; and when the whole is consolidated by a varnish, the appearance is that of a costly vessel of porcelain, with moulded ornaments, richly coloured.

Casts of Medals in Sulphur. Executed by Mr. WILLIAMS, *Spitalfields.*

THESE are economical multiplications of the works of the medallist, which, from their rarity or their intrinsic cost, fall into the possession of but few, and must have interest with the mechanical philosopher from their subjects; but the art which produces them will, from these instances, ingratiate itself with the artist and the man of taste, by the metallic surface and agelike tone of colour, and fidelity to original art, of which its peculiar material is thus exquisitely susceptible.

Patent Self-acting and Keyed Upright Grand Piano Fortes. By ROLFE & SONS, 112, *Cheapside.*

TWO of these beautiful specimens of mechanical skill applied to the most fascinating of the sciences (and including the most recent improvements) are exhibited in the gallery, where the visitors are constantly regaled by their powerful melody.

The improvements introduced by Messrs. Rolfe & Sons being of considerable extent, they have divided them into three distinct sections; their self-acting piano fortes are therefore constructed with the first section of their patent only, or the first and second sections combined, or with the three sections united.

The first section consists of a new apparatus for effecting the transitions of *forte* and *piano*, by which means the difficulty of producing those desirable changes is removed, by transfering the mechanical action from the weakest and most uncertain part of the arrangement—viz. the cylinder to the more powerful and certain action of the engine, by which transfer, the liability to de-

rangement in instruments intended for exportation is avoided. To this branch of their patent, Messrs. Rolfe and Sons have annexed a hand-movement, or register, by which the existing arrangement of, or distribution of the *forte* and *piano*, may at any time be changed, or attend to suit particular views; or may at any moment be removed from the government of the *self-acting apparatus* which produces the effect, and be operated upon by the hand; and again be restored to the control of the machine, at pleasure.

The second section consists of a new barrel movement for changing the tunes, which is effected by the introduction of an inclined plane, which forms an abutment for the axis of the cylinder. This plane is divided into eight portions, and is moved by a radial lever acting upon a pinion, which by its rotation one revolution moves upon a second dial an index to the extent of one-eighth of its circumference, moving the inclined plane to a proportionate extent. By this simple arrangement, the motions are rendered very steady and accurate, and eight distinct airs may thus be performed.

The third section consists in the application of a set of dampers to the self-performing action, which are altogether independent of the dampers of the finger department: so that each note of the self-acting or mechanical part of the instrument, in common with each particular note of the finger action, possesses its appropriate damper, connected with, and identified by, its kindred note, hammer, or key, and acting simultaneously therewith. In conjunction with the application of the mechanical dampers, Messrs. Rolfe & Sons have also introduced suitable staples in their cylinders, which, acting upon each particular damper as occasion may require, suspends its operation, and enables them to retain the vibration of any given note, or the root and relative intervals of harmonious combinations, in the same manner as the finger of a performer sustains the vibration of chords whose existence is to be prolonged by continued pressure of the keys, according to the duration expressed by the determined value given to them by the author in the composition performed. In addition to this, the whole set of mechanical dampers are occasionally raised by the cylinder, according to circumstances, in order to produce the effect, or full swell, of the open pedal when moved by the foot of the performer.

Thus constructed, these self-performing piano-fortes possess the admirable ability of administering to the intellectual enjoyment of the many, and conducting an evening's amusement with the most exquisite propriety and effect, without the assistance of the scientific performer. At the same time, they do not exclude or oppose the efforts of manual dexterity; as, independent of their self-acting power, they comprehend all the admirable properties of a grand cabinet piano-forte with extra additional keys, and invite the application of the most expert finger in the ordinary method of performance.

Transparent Astronomical Maps, designed by T. THOMAS, *National Repository, and painted by* W. I. SIMPSON, *Newman Street.*

THESE maps are four in number; the two first are planispheres, exhibiting the fixed stars termed the constellations, up to the fourth magnitude, in a very simple and beautiful manner; and having the earth in her path in the zodiac. These planispheres are divested of the ancient fabulous configurations commonly used in distinguishing the fixed stars, (as bear, dog, &c.) each cluster of which, or a constellation, being merely traced in a faint outline, thus enabling a superficial observer easily to learn and recognise the constellations as *they appear in nature;* an object of some moment when it is considered (as astronomers rationally believe) that the fixed stars are to other systems of planets what our sun is to this; that each has revolving around it planets similar to those in our system; and that many of these planets again have moons revolving around them, which perform the same duties towards their primary planets, which moons, or secondary planets, discharge in our system.

Mr. Thomas's third map is termed a tellurium, exhibiting the earth in the equinoctial and solstitial points in her orbit round the sun, representing the four seasons. To an observer on a given meridian, is illustrated a mid-day view of the earth in winter; a sunrise view in spring; a midnight view in summer; and a sunset in autumn. The phases of the moon are illustrated by placing her also in four parts of her orbit round the earth, viz.—in conjunction and opposition, and in her waxing and waning quadratures.

The fourth map is a representation of the planetary system, arranged in the usual way, viz.—the orbs mercury, venus, earth, mars, ceres, pallas, juno, vesta, jupiter, saturn, and georguim sidus, with their sattellites in their respective paths round the sun.

These maps being upon rollers, and producing a very pleasing effect to the eye, besides being sufficiently transparent to admit the light, may be employed at pleasure as ornamental sun blinds to any apartment; they would thus be the means of *forcing* an acquaintance with astronomy upon every occupant of the rooms where they are placed; and would, notwithstanding the compulsion, be a very agreeable and easy mode of acquiring astronomical knowledge. To a library or study, Mr. Thomas's map blinds would form most appropriate and useful appendages; and it is due to the ingenious and intelligent inventor to add, that he has fully attained his object of combining ornament and utility in their adaptation.

Read's Syringe Valves.

Amongst a variety of articles on one of the tables in the gallery we observed two of the "rose-heads" and valves belonging to one of the ingenious Mr. Read's syringes, as adapted to various purposes; these inventions, it must be confessed, are not *very* novel, but they are good, and as such ought not to be omitted in our work, where we desire to see every thing of merit, whether new or old, provided they be not too generally known. We had, however, another motive for bringing these little contrivances under the notice of our readers. Such information as we possess has led us to believe, that Mr. Read was the first person who improved the common shower syringe, by introducing a valve into the rose-head that would permit the water to flow rapidly into the cylinder, instead of through the minute holes, which valve would close from the pressure of the fluid during the discharge. By a reference to our account of new patents, in the present number, it will be seen, that syringes on precisely this principle, have been very recently patented by a Mr. Macdougall.

In Plate II, fig. *a*, represents one of these valves, which consists of a little metallic sphere placed loosely inside of the frustum of a cone, but prevented from falling through the largest end by a bar placed across the aperture. This ball is of course forced against the bar on drawing in the water; and in discharging the water the ball is forced outwards, filling up the circular aperture, the liquid escaping in a fine shower through the perforations shewn. This cap *a* is screwed on to a syringe to be used for washing away the insects from fruit trees, and other horticultural purposes.

The other cap delineated marked *b*, has two conical tubes, one with a ball, the other without; and is intended chiefly as a convenient domestic instrument for extinguishing fire. It receives its charge quickly through both holes, but is discharged only through one in a stream, the distance to which it is projected depending upon the degree of force applied to the piston rod.

VELOCITY OF SOUND.

This celebrated problem, which occasionally occupied the attention of the scientific world for the last 150 years, Newton, who first attempted the solution, found his result 170 feet per second short of the experimental velocity. Euler and other mathematicians, obtained similar results until the time of Laplace, who by the introduction of a new hypothesis, obtained results within 14 feet of the truth, as determined by experiment. But Mr. Herapath, with only the data of Newton, namely, the elastic force and specific gravity of the air, corrected by his own discoveries on the nature of airs, has produced a theorem which agrees with the mean of the best observations, to within 1½ inches per second. In dry air, at the freezing point, he computes the velocity at 1089·4 feet per second; while the mean of the experi-

ments, Captain Parry, in the North, the French Academicians, Dr. Gregory, M. M. Arago, Dr. Moll and Goldingham, at Madras, gives 1089·3, when reduced to the same temperature.

Mr. Herapath has found too, that heat and sound are transmitted with equal velocity through the atmosphere; the rate of transmission increases or decreases with the temperature of the air, and decreases perpetually the higher we ascend; the heat diminishes uniformly at the rate of one degree Fah. for every 326 1-8th feet of altitude, or 16 1-5th degrees Fah. for every mile; the total altitude of the air is, "at a medium better than thirty miles," and the time sound would take to travel vertically through it, four minutes and 47½ seconds. Besides these, the author draws some curious and unexpected consequences. He affirms, that the quantity of air has nothing to do with its total altitude, "which would remain the same whether there was a half, a third, or a hundred times the quantity;" that an atmosphere of hydrogen would be 14 2-5ths times higher than ours is, that the greater the attraction of a body, in the same proportion the less is the altitude of its atmosphere, and *vice versa*. Hence he draws a physical proof of the phenomenon so often observed, but as yet unexplained by astronomers,—namely, the disproportionally small attraction of comets. He likewise notices and explains a very novel and curious paradox: for example, that the pressure of the air at the surface is uninfluenced by the velocity of sound, while, in the higher regions of the air, the pressure depends "on this very velocity."

For computing the diminution of Fahrenheit temperature for any elevation, the author gives the following rule:—"Take a 1-100th of the altitude in yards; subtract a 1-10th of this from itself; and then add 2-10ths of the part 10 subtracted." The fall of temperature for an altitude of 7,600 yards is thus found to be 69·92, Fah.

STEAM ENGINE WITHOUT BOILER.

The suggestion contained in the annexed letter from Mr. L. Gompertz may probably be well worthy the attention of those who can afford to devote the time, and incur the expense, of investigating by experiment, its feasibility and general economy. If really practicable, the advantages that would result are not overrated by our correspondent; whose well known scientific acquirements and mechanical ingenuity, must give weight to any proposition emanating from him. While we say this in justice to the writer, we must own, that we individually entertain but slight hopes of success. By a reference to our 4th vol. First Series, p. 66, it will be seen, that Mr. Thomas Howard generates the alcoholic and ethereal vapours in his engine, by a similar process to that suggested by Mr. Gompertz, and it would appear, by the

following extract from his specification, at p. 69, ibid. that Mr Howard contemplated the application of the same mode of producing vapour for a *steam* engine; it runs thus:—"But I moreover claim as my exclusive invention, the application for the purpose of giving motion to machinery, of vapour generated from the liquids within the cylinder or other vessel, in which the power operates, the vapour receiving an increase of expansive power by the heat of the said vessel; particularly when the vapour is generated from such liquids as evaporate at a lower temperature than water."

SIR,—The *steam-engine* having arisen to such excellence, and become so much the study of superior talent, that any attempt from a cursory observer, to improve it; and this essay offered in its crude state to the public, justly demands an apology. But when it is the *mere possibility* of a useful result that has stimulated the research, which want of opportunity prevents from being first matured, and when the stain that would result if the plan should prove erroneous is risked, for the slight hopes that the desired benefit may be conferred, it is trusted pardon will be granted; and with these views I beg humbly to submit, through your valuable medium, the following proposition to the notice of more competent judges; leaving to them, also, the manner of its accomplishment, the principles of which are:—

For the *boiler* to be *omitted*, and for the bottom of the cylinder to be *seated within the fuel*, while the steam is to be generated by jets of water falling at intervals upon the heated bottom; and when the piston shall have arisen to its proper height, for a valve to open near the bottom of the cylinder, to allow the steam to escape, and the piston to descend. Or if the cylinder be *horizontal*, the operation may be effected on each side; the steam acting on the piston also on each side. But as the cylinder would require to be very hot, the production of a vacuum by cold and condensation appears objectionable, though experience must decide this point. The advantages seem to be:—

1st. That no accidents of the bursting of the boiler can occur; while the exploding of the cylinder is little to be feared, this being easily made strong enough, and containing no scalding water.

2nd. That the expense, as well as the weight of the boiler would be saved, the latter being a great desideratum in steam carriages.

3rd. That less fuel would be required; there being no water nor boiler to keep hot, but merely the cylinder.

4th. That the engine would sooner be ready, there being no water to *boil*.

LEWIS GOMPERTZ.

OBSERVATIONS ON THE HARDENING OF STEEL.

By Rufus Tyler, Mechanician, Philadelphia.

The following remarks on the subject of hardening, steel are offered to the Institute as the result of much experience in the regular course of my business, and of essays suggested by some peculiarity, accidentally noticed, and made for my own satisfaction. It is, perhaps, to be regretted, that I have not had leisure to repeat them with a view to greater accuracy of detail; by some, however, this may be deemed a favourable circumstance, as they are not fortified by any array of numbers, or formulæ, and may, therefore, be the more readily discussed, corrected, and amended, for which I am fully aware my best endeavours leave ample room.

The peculiar kind of hardening of which steel is susceptible, depends upon two conditions: first, *a sufficient degree of heat*, (somewhat above the lowest red,) which may be termed the hardening heat; and second, *sudden cooling*. A deficiency of only a few degrees of heat, or an excess of two or three seconds of time, beyond certain limits, will *entirely* defeat the operation.

The usual method of hardening steel for common purposes, is to heat it to the proper degree, (the lower the better, provided it be not so low as entirely to fail to harden,) and then to plunge it suddenly into cold water. When it is requisite to protect the surface from the corroding effects of the atmospheric air, as in engravings, dies of delicate workmanship, &c. it should be imbedded in fine charcoal powder, previously heated to redness, in an iron box, to drive off the evaporable manner, and when sufficiently heated, the piece must be removed to the cooling liquid with as little exposure to the air as possible. If the contents of the box be thrown, with the steel, into oil, so as completely to exclude the air, it will preserve its polish, and brightness unchanged.

All articles of steel are more or less liable to become warped, by rapid cooling, from the unequal contraction of the parts, and many, from the same cause, require the greatest dexterity and skill, to prevent them from breaking in pieces during the operation.

Whenever, therefore, the nature of the case admits the use of oil, as a cooling medium, it is safer than water, being much less rapid in its operation. It is obvious, however, that as large masses of steel can with difficulty be cooled, even in water, within the hardening limit of time, only small articles, such as springs, thin blades, &c. can be hardened, at all, in oil. It is sometimes pretended that oil imparts a degree of toughness to steel hardened in it, just as it would to a bit of horn, or leather, by penetrating its pores; and I believe the patent obtained for the use of it, in hardening a certain *celebrated patent oil-hardened-spring truss,* was grounded upon such a supposition.

The danger of breaking increases with the *thickness* of the piece, whatever may be its form; and that form is least liable to break, in which there is the greatest freedom of motion, or in which a simultaneous contraction can be effected in all the parts.

In hardening a roller, say two or three inches in diameter, and about the same in length, the first tendency of the contraction of the surface is to separate it. But this strain being equally divided around the circumference, and the metal being in a yielding state, the only effect in general, is, to enlarge the surface beyond its original dimensions. The surface thus enlarged, immediately becomes hard and fixed; so that the subsequent cooling of the centre, reverses the strain upon the surface, tending to compress or shorten it, and that to such a degree, that a segment is often thrown off with great violence, or, when the outer portion has sufficient strength to resist the contracting force of the centre, that portion in its turn tends to separate, being prevented by the outer part, (to which it adheres) from returning to its original dimensions. In this case, a separation at the centre is inevitable, unless a part of the heat be allowed to remain, until the surface be relaxed by tempering, after which it may be suffered to cool. When a rent commences at the centre, the parts generally separate with such force as to sunder the mass, accompanied by a loud report.

It sometimes happens in the breaking of dies, rollers, &c. (in which the tempering has been omitted) that the effect does not take place until several hours, and even days, after they have been hardened.

Steel is allowed by authors to expand about 1-8th of an inch to the foot, in heating to the hardening point, and to contract, on cooling, about 2-3ds of what it had been expanded, provided the hardening effect takes place; otherwise it returns nearly to its original size. Accordingly, I have been in the habit of making allowance for this enlargement, which is generally found to take place, in a greater or less degree, and for many years held the opinion that it was a necessary consequence of hardening steel, and that this effect *ought* to take place, just in proportion to the degree of hardness produced.

With this doctrine, however, facts are at variance, and, I believe, that the circumstance, above alluded to, as the cause of breaking, may also explain most satisfactorily, the phenomenon in question (to wit) that of hardening the exterior, before it can possibly be permitted to contract to its proper size, because of the expanded mass within.

I have found in a number of cases of thin hollow cylinders, or flattened rings, where there was the best chance of thorough, and almost instantaneous cooling, and, of course, of producing the greatest degree of hardness, that no enlargement was perceptible.

Particular care should be observed, in the act of cooling, not to suffer any intermission, in any part, as is often done by moving the piece backward and forward, too briskly, in the water, alternately cooling, and exposing to a vacuum, the opposite sides; for a part thus exposed, after moving rapidly against the current, until fairly hardened, might be let down, or tempered, as it is called, by the heat rushing from the centre, toward the side exposed to the vacuum, without being sufficiently re-heated to prepare it for hardening at the

return of the current of water. In this way, soft places are often produced, which will erroneously be attributed to uneven steel, want of sufficient heat, &c.

By dipping the end of a small bar, (heated to several inches in length,) and keeping it quite still, until it is hardened nearly to the surface of the water, (which should be very cold,) and then raising it quickly, an eighth of an inch, or more, according to the size of the bar, a portion of what was hardened, will be softened by the heated part above;—as soon as this is perceived, let the bar be again sunk into the water, to where it remains of a hardening heat, which will be perhaps half of an inch lower than before, another portion of about 3-8ths of an inch will thus be hardened; let the bar be again withdrawn a small distance, as before, repeating the operation, until there no longer remains sufficient heat in the bar for hardening; the result will be, a number of successive hard and soft rings.

While testing the strength of different kinds of steel, by repeatedly hardening each kind, until a fracture should take place, I was somewhat surprised to find the pieces, which were small, (such for example as were an inch square, and 3-8ths, or half an inch thick,) considerably swollen, after three or four times hardening, and that every hardening increased their convexity, until they actually burst the surface, in the middle of one of the faces. Repeating the experiment, with a piece prepared perfectly flat, I found the first, second, third, and fourth time, of hardening each, to produce a small additional elevation of the surface. On the fourth attempt, the piece cracked.

I have seen a thin piece of steel very beautifully hardened, by chilling in its passage through a rolling mill; this piece afterwards exhibited in its fracture an exceedingly fine grain, a probable consequence of its being hardened under immense pressure.

Small drills, and other articles of the thickness of a small needle, may be cooled, with sufficient rapidity to become hard, by moving them briskly through the air.

Water, to be active, in cooling, should be perfectly free from soap, —a small portion of that substance will cause the time of cooling to be extended beyond the hardening limit, especially if the piece of steel be not very small.

The grain of steel, though finer when hard than when soft, becomes still finer, the lower the temper be drawn, until about a medium between hard and soft, when the fineness begins to decrease.

Cast-iron is capable of being hardened in the same manner as steel, except the kind which is already hardened at the time of casting. This kind possesses a superior degree of hardness, which differs materially from that obtained in the manner of hardening steel. It takes place in passing from the fluid to the solid state, and can only be changed by re-melting. As soon as time will permit, I intend offering some remarks on hard and soft cast-iron.

The most satisfactory theory of hardening steel, which also applies to cast-iron, is one suggested by Mr. William Mason, of this

place. He supposes, that at the hardening heat, the component parts of steel exist in a state of perfect chemical union, and that if time be allowed in cooling, that union is dissolved, or changed to a simple mechanical mixture. This he conceives to be supported by the following experiment: melt together certain proportions of zinc and quicksilver, and pour one part of the amalgam into water, and the other into a wooden or paper mould; that which is poured into water being suddenly chilled, retains its chemical union, and becomes of the consistence of paste; the other separates, the zinc forming a solid cellular body, holding the quicksilver in very minute globules in its interstices.—*Franklin Journal.*

American Door Spring.—A spring ten or twelve inches long is let into the back or hinge stile of the door, a long mortise being made in it for that purpose. The spring is fixed firmly at its lower end; its upper end is bent so as to form a hook, which is connected by a short rod to a staple in the rebate of the frame. When the door is closed the spring retires towards the bottom of the mortise; when open it approached the edge of the stile, and acts upon the door.—*Ibid.*

LIST OF NEW PATENTS SEALED.

PENS.—To J. Perry, of Red Lion Square, Holborn, Bookseller, for an improvement or improvements in or on pens.—Dated 24th April, 1830. Specification to be enrolled in Six Months.

BRITISH TAPIOCA.—To J. M'Innes, of Auchenreoch, and of Woodburn, North Britain, Esq., for the manufacture or preparation of certain substances which he denominates the British Tapioca, and the cakes and flour to be made from the same.—24th April, 1830. Six months.

BOLTS AND CHAINS.—To S. Brown, of Billiter Square, London, Commander in our Royal Navy, for certain improvements in making or manufacturing bolts and chains.—24th April, 1830. Six months.

STEAM BOILERS.—To J. Cochaux, of Fenchurch Street, London, Merchant, for an apparatus to prevent or render less frequent, the explosion of boilers in generating steam. Communicated by a Foreigner.—Dated 24th April, 1830. Six months.

FUEL.—To. P. Descroizilles, of Fenchurch Street, London, Chemist, for certain improvements in apparatus for economising fuel in heating water and air, applicable to various purposes.—24th April, 1830. Six months.

BOATS.—To T. Cook, of Blackheath Road, Lieutenant in our Royal Navy, for certain improvements in the construction and fitting up of boats.—24th April, 1830. Two months.

PAPER.—To J. Wilks, of Blue Anchor, Bermondsey, Engineer, &c. for an improvement or improvements in a part or parts of the apparatus for making paper by machinery.—28th April, 1830. Six months.

ORES.—To T. Petherick, of Penfullick, Cornwall, Mine Agent, for machinery for separating copper, lead, and other ores, from earthly and other substances with which they are or may be mixed, and which is more particularly intended to supersede the operation now practised or used for that purpose, commonly called jigging.—28th April, 1830. Six months.

COCKS.—To J. Walker, of Weymouth, Middlesex, Esq. for an improved cock for fluids—4th May, 1830.

BRICKS.—To H. R. S. Devenoge, of Little Stanhope Street, May Fair, Gentleman, for certain improvements of machinery for making bricks. Communicated by a Foreigner.—8th May, 1830. Two months.

DESCRIPTIVE ACCOUNT OF ALL THE
PATENTS ENROLLED BETWEEN 20TH MAY AND 20TH JUNE 1830.
Particularizing the Offices in which the Specifications may be inspected with the Dates of Enrolment.

WOOLLEN CLOTHS.—To Thomas Gethen, of Furnival's Inn, London, Gentleman, a patent for "certain improvements in dressing woollen cloths," was granted on the 21st of November, 1829, and the specification was deposited in the Rolls Chapel Office on the 21st of May, 1830.

The object of this patentee is, to apply heat to the cloth while subjected to great mechanical pressure, and for this purpose he proposes to employ a steam tight trough, of sufficient length and breadth to admit of a piece of cloth of the usual dimensions being laid flat without folding. Across the bottom of the trough are placed a series of bars to support the bottom flooring on which the lower piece of cloth is laid. This is to be covered with a layer of boards, then another piece of cloth, and so on with successive layers of cloth and boards till the pile is of the required altitude. Over the top boards, are placed a series of cross bars, which are connected with the bottom cross bars by means of vertical iron straps on each side; and through these, screws act upon the upper board, and thus constitute a screw press independently of the containing vessel. When the cloth has been screwed into this press and deposited in the steam vessel, heat is to be applied, which being steam heat, can be regulated with much facility and considerably increased without injury to the cloth.

The different parts of this apparatus are represented in Pl. IV. by fig. 7, which is a plan, and fig. 8, which is a transverse vertical section, where *a a a* shows the steam tight trough, *b b b*, the boards placed above, below, and between the pieces of cloth. *c c c c*, iron straps connecting the top and bottom cross bars by which the pressure is applied. *d d*, the cross bottom bars connecting the lower ends of the straps *c c*; *e e*, top bars connecting their upper ends. *f f*, longitudinal bars by which the pressure of the screws which pass through the bars *e e*, is transferred to the cross bars *g g*, which are operated upon in pairs, as represented in both figures.

When the cloth has been a sufficient time subjected to heat and pressure, the top of the steam trough is removed, and the press containing the cloth is elevated by means of a crane appa-

ratus to which it is suspended by chains, and when the press is raised above the trough it is moved away by a pinion acting on an extended rack from the steam trough to facilitate the exchange of the cloth.

STEAM ENGINES.—To Joseph D'Arcy, of Leicester Square, London, Esq. sole executor and residuary legatee of Charles Broadrip, late of Spring Gardens, Esq. deceased, a patent for "certain improvements in the construction of steam engines and the apparatus connected therewith," was granted on the 29th of November, 1828, and the specification was lodged in the Enrolment Office on the 29th of May, 1803, eighteen months having been allowed to enrol the specification.

This patentee proposes to connect the upper end of the piston rod immediately to the crank, by which rotatory motion is produced, without the intervention of guide rods or parallel motion; neither does he require the cylinder to oscillate; but he makes the piston rod to accommodate itself to the different positions of the crank by vibrating, and for that purpose it is attached to the piston by a hinge joint. And the stuffing box through which it passes is made to slide in a dove-tail shaped groove, backwards and forwards, across the top of the cylinder, while that part of the box through which the piston rod passes, has a small oscillating motion on steam tight joints, that it may retain the position of the piston rod.

Instead of this sliding stuffing box apparatus, Mr. D'Arcy proposes under certain circumstances, to surround the vibrating piston rod by a cylinder which is attached steam-tight to the piston, and made sufficiently wide for the piston to vibrate within it. In this case, it is evident, that the inclosing cylinder, and not the piston rod, must work steam-tight through the stuffing-box.

It is not very clear what advantage the patentee had in view by these arrangements; but it is probable, that he has over-rated the imperfections of the parallel motion and the sling connecting rods and guides usually employed, as it is perfectly evident, that either of the plans which he has patented will add to the difficulty and expense of manufacture, and also to the waste of power by an increase of the rubbing surfaces; whether they be in the form of a sliding stuffing-box, or the enlarged cylinder working through a stuffing-box of the usual construction. Besides, in the latter plan, the area of the upper side of the piston is so much diminished by the piston rod case, that the difference between the force of the steam exerted on the upper and under sides of the piston will cause an irregularity in the operation.

In addition to these inventions, the patentee describes a method of transmitting motion from one part of machinery to another, which consists of similar cranks connected together by rods either straight or branched; and this is said to be very useful on board of steam vessels; but it is really a contrivance possessing so little originality and importance that workmen have long been accustomed to design such plans whenever they required to transmit motion to different parts of a factory or of a machine, without ever imagining that they had invented any thing worth protecting by his Majesty's letters patent, or even communicating to their fellow workmen.

FARINA AND SUGAR.—To Benjamin Goulson, of Pendleton, near Manchester, Surgeon, a patent for "certain improvements in the manufacture of farina and sugar from vegetable productions," was granted on the 14th of December last, and the specification was deposited in the Enrolment Office on the 12th of June, 1830.

Mr. Goulson's method of converting certain roots, as dhalias, beets, carrots, mangel wurzel, potatoes, &c. consists, in the application of acid. After the roots have been well cleaned by washing, and cleared from their skins by rubbing or other process, they are to be sliced or grated, and steeped in a mixture of pure water and acid (the preference being given to sulphuric acid), in a ratio varying from two to ten pounds of acid, according to the roots operated upon, to a hundred weight of roots; the last mentioned requiring the greatest proportion of acid. In this mixture the roots are to be kept till they become quite soft and pulpy, when they are to be washed with pure water till they cease to taste of the acid. They are next to be dried in the sun, or in an oven, and then ground into flour, and used for making bread or other purposes for which wheaten flour is employed.

To extract the saccharine matter from roots, Mr. Goulson proposes to employ a second dose of diluted acid, in the proportion of from two to ten pounds of acid to a hundred weight of the farina thus obtained, and by this means the fibrous parts become macerated: after which the acid it to be neutralized and separated from the saccharine portion, which is then to be clarified by the usual processes: or the saccharine matter may, by continuing the first process and using an additional quantity of acid, be obtained at once, without first converting the roots into flour.

UNITED KINGDOM STEAM SHIP.

In our 3rd vol. N. S. p. 369, is given a description with engravings of the *boilers* of this immense steam vessel, and we are now enabled to furnish our readers with the following account of the engines by which she is worked.

In the subjoined engraving, fig 1, represents an end view of the two engines, and fig. 2, a side view of one of them. The letters refer to the same parts in each. The cylinders *a a*, are of cast iron, and fixed to a framing, which is bolted to the bottom of the boat. The piston rods *b b*, are keyed at the upper ends, to the cross heads *c c*, to the exterior ends of which are attached the connecting rods *d d*. The lower ends of these connecting rods are inserted in the forked ends of the beams *e e*, which vibrate upon a shaft *f*, the bearances of which rest upon the top of the condenser *g*. In the same forks are inserted the ends of other connecting rods *h h*, which are keyed at their upper ends to cross heads *i i*. In the centre of these cross heads are bushes large enough to receive the rods *j j*, which extend to the crank pins of the crank *k k*. These cranks are fixed to the main shaft, which rests upon the bearances *l l*, upon the arches *m*, which are bolted to the cross beam, as at *n*. The shafts are shewn as broken off at the outer ends, but they extend to the outside of the paddle wheel.

The side beams *e e* are not straight, but have two bends represented by the lighter parts of the shading, the ends near the cylinder being therefore much farther apart than the opposite ends, so that they may take up as little room as possible, by laying close to the respective parts of the machinery. They are also forked at the end nearest the air pump *o*, so as to admit the insertion of the pump rods *p*, which are connected at their upper ends to the cross head *q*, in a bush, in the centre of which is keyed the air-pump rod *r*. Connecting rods *s*, are attached at *t*, to the side beams *e*, and at their upper ends to cross-heads, which are connected as at *u u* (fig. 1) to two rods, which work the plungers of two feed pumps *v*, for supplying the boiler.

j is the apparatus for blowing through previous to starting the engine. It consists of a cock which opens or closes a communication between the steam chest and condenser by turning the handle.

The rod and lever *x*, are for the purpose of regulating the quantity injection of water, which enters into the condenser by a pipe from the outside of the vessel, and can be increased and lessened in quantity, by turning a cock, to which the rod *x* is attached. *y* is the hot well, into which the condensing water is discharged from the air pump. The feed pumps are supplied with water from this hot well, through the medium of a pipe, the overplus being discharged through the side of the vessel, by another pipe which is not seen.

In the steam chest 1, is contained the sliding valve. For the purpose of explaining its principles we shall here introduce a separate diagram, which may be taken as a representation of the best form in which it is constructed, though it varies somewhat in its re-

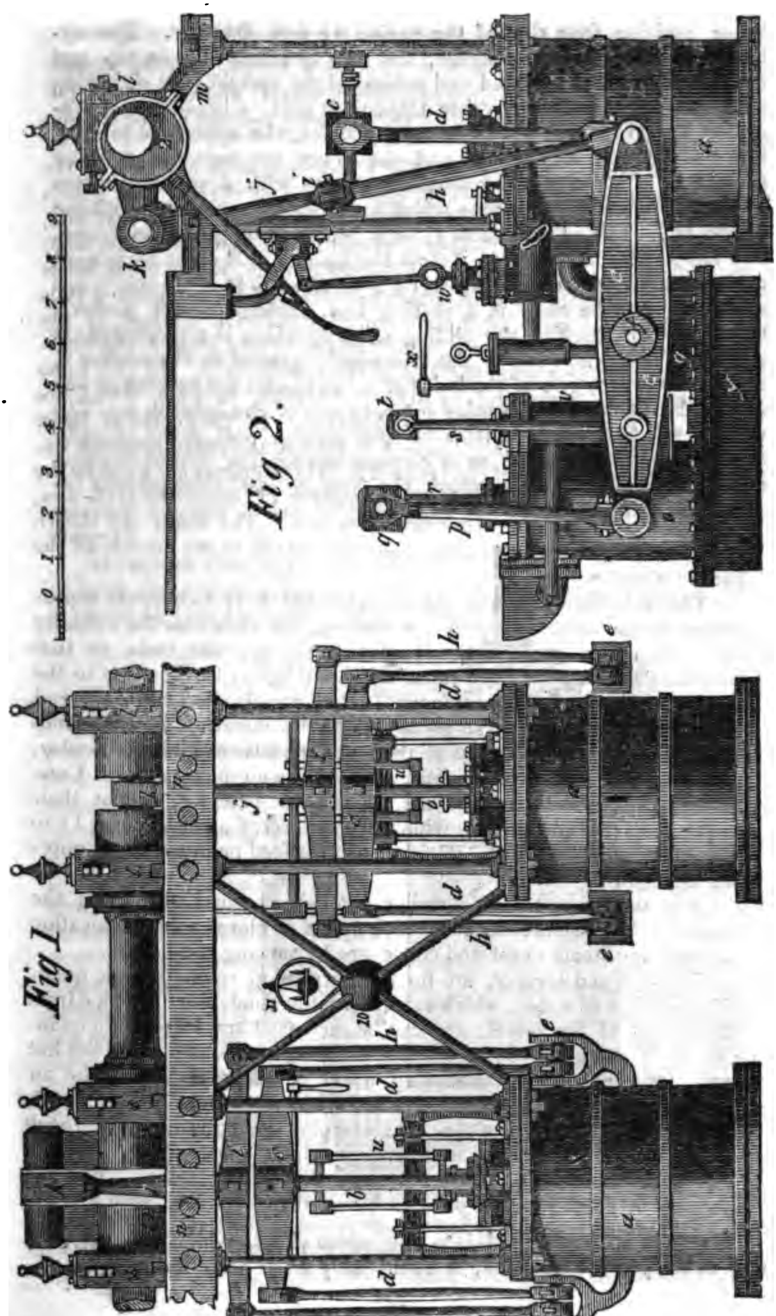
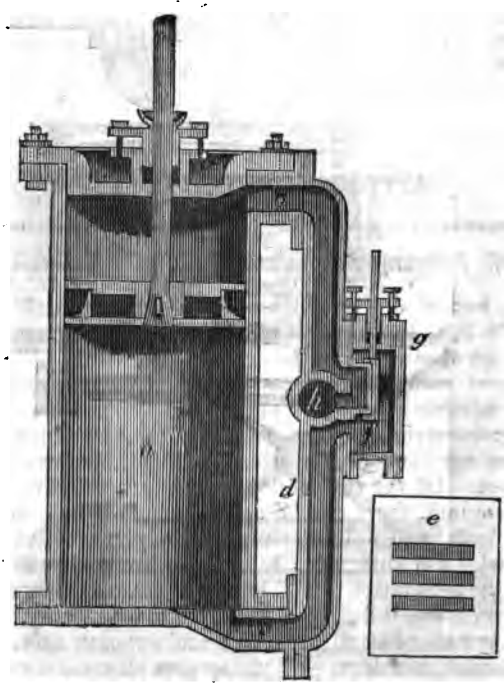


Fig 2.
Fig 1

lative position from that of the engine we now describe. The cylinder *a* in the following figure, has two apertures *b c*, at top and bottom, to which are bolted and cemented the upright pipe *d*, having near its centre, or in any other convenient part, a broad face represented at *e*, in which are three oblong holes, the upper one running into the cylinder through *b*, and the lower one into the cylinder through *c*. The middle one communicates with a separate recess *h*, to which is attached a pipe which forms a communication with the condenser. The steam chest *f*, is a rectangular box of cast-iron, and has a pipe attached to it from the boiler; this chest is covered over and made steam tight by a lid *g* screwed to it. On the upper side of the steam chest is a stuffing box, through which passes a turned rod for working the sliding valve *h*, which is represented in section. This valve has a flat face neatly ground to the surface *e*, sufficient to cover two of the holes of *e*, and twice the breadth of any one of the surfaces intervening between any of the holes in *e*. The valve is raised into a box, from its open interior part, being of sufficient dimensions to cover, as in its present situation, two of the passages *e*, and leave open a third, the bottom one in the present instance being open.



If steam were admitted into the steam chest, whilst the valve was in its present position, it could only enter into the cylinder

through c, and consequently would cause the piston to ascend, whilst the air above it would be discharged through b, and the open part of the valve, and so into the condenser; but suppose that the valve be depressed so as to cover the middle and lowest holes, then the steam from the boiler would have free communication with the upper side of the piston through b, which it would consequently force downwards, whilst the steam used in the ascending stroke would be discharged into the condenser, through the interior of the sliding valve; so that by changing the situation of the valve, the piston may be made to ascend or descend at pleasure.

The mode by which the valves in the engine before mentioned are worked, is by eccentrics on the main shaft, which work cranks; a spindle extends across between the supporting columns, in the centre of which is another crank, which gives motion to a slide rod, through the medium of two other rods.

The piston rods and cross-heads preserve their vertical motion, by horizontal bars, having adjustable brasses on their outer ends, fitted to the columns, upon which they work smoothly up and down.

The framing of the two engines is bound together by eight bars meeting together in the ball 10, upon the top of which is fixed a lamp 11.

It appears that 20 cwt. of Weyms Coal, per hour, are necessary to keep this engine going, and consequently her average consumption is about 45 tons for each voyage.

APPLICATION OF HEAT.

Remarks on Messrs. Beale & Porter's Patent Method.

The following has been sent to us for insertion.

[In the former notices of this valuable invention (Nos. 26, 41, 42, & 64, N. S.), the means it affords of generating and applying steam at high elasticities are described; and we are now informed that the most complete success has attended its application to this most desirable object.]—Edit.

"The persevering labours of some of the first mechanical geniuses of the age, sufficiently attest the high importance attached to this suject. Of the superiority of high-pressure over condensing steam engines, there can be no question, whether we consider their cost, bulk, and weight, simplicity of construction, or economy of fuel. The difficulty has hitherto been, how to construct boilers for the generation of highly elastic steam with a due regard to safety. For this it has been proposed to provide by employing generating vessels of small capacity; and strength may, no doubt, be thus attained, to a degree which removes all ground of aprehension; *but only for so long as the apparatus shall remain uninjured by the fire*: and when by means of such an arrangement, very high steam is generated, it has been found practically impossible so to

regulate its degree of heat, so that the machinery to which it is applied, shall remain uninjured by the surplus caloric. It is evident that by Messrs. Beale and Porter's mode of steam generation, all these points are sufficiently provided for. By the choice of the fluid medium, the temperature, and consequently, the elasticity of steam produced are precisely limited and regulated, so that no surplus heat can possibly be carried over to waste fuel or to injure the engine. The most absolute safety is thus attained, independent even of all safety valves, and the permanence of the apparatus is provided for, as no injury can ever arise to it from the fire, by which, as will be seen by reference to our diagram, it is never touched.

"The advantages of using steam expansively are too well known to need explanation on this occasion. The consequent great economy is well understood in Cornwall, where the largest engines are worked in this manner; but the advantages hitherto derived from this means are trifling, when compared with those which would result from the employment of the principle with steam at high elasticities. Correct ideas may be formed upon this head, by consulting a paper inserted in the first volume of our New Series, page 72, wherein it is shewn, that steam of 400 pounds pressure on each square inch being used, and the supply to the cylinder of the engine cut off at the quarter stroke, the average pressure employed throughout will be equal to 250 pounds on the inch, and the whole sum of the four quarters will be 1000 pounds. Whereas, if the steam had been allowed to fill the cylinder with a pressure of 400 pounds, the sum of the four quarters would have been 1600 pounds; thus consuming four times the volume of steam, and consequently using four times the quantity of fuel, with an addition of only sixty per cent. to the power, establishing, consequently, a clear gain of one hundred and fifty per cent. in favour of the expansive system. Another source of economy attending the use of very strong steam, arises from the smallness of the engines then necessary, thereby most materially reducing the amount of friction, and causing the ratios of absolute and effective pressure on the piston to approximate more nearly to each other. This diminution of bulk should, of course, occasion diminished cost of construction, and will besides, admit of the employment of steam power in situations and for objects where the cumbrous and complex nature of ordinary boilers and engines form objections to their use. This remark applies peculiarly to loco-motive carriages, where the utmost simplicity and compendiousness are required.

"Perhaps we are not far from the truth in suggesting, that to the greatbulk and weight of the machinery employed, and the resulting necessity for corresponding weight and strength in the vehicles are mainly to be attributed to the want of success hitherto attending the attempts at running steam coaches on the turnpike roads.

"The same argument applies with almost equal force to the employment of very elastic steam for the purposes of navigation; and as safety to persons and property has been the only object which has hitherto induced the employment of cumbrous and expensive condensing engines, we should expect that now this object can be so unfailingly attained, parties constructing steam vessels will avail themselves of the means afforded for so important a saving both in the original construction of the vessels and machinery, and in the expenses attendant upon their navigation.

"The diagram given at fig. 6, Pl. IV. will explain the mechanical arrangement.

"*a a*, the vapour chest, formed of thin plate-iron.

"*b*. The generator, which may consist either in a rectangular box or chamber, or in a coil of wrought-iron tubing, of small diameter.

"*c*. The fluid medium for communicating heat.

"*d*. The breathing pipe, answering the same purpose as the corresponding in the diagram at page 245, vol. 3. N. Series.

"*e*. An ordinary furnace and flue.

"*f*. The ashpit.

"*g*. The chimney.

"*h*. The supply pipe to the generator, through which water is injected by means of a forcing pump, worked by the engine.

"*i*. The steam pipe, communicating with the cylinder of the engine.

"The water injected through the supply pipe *h*, being exposed during its progress through the generator to the heat of the vapour furnished by boiling fluid *c*, is thereby converted into steam, with a temperature and elastic force answering to the temperature of the vapour, which, losing a portion of its heat, resumes the liquid form, and falls to the bottom of the chest *a*, while the partial vacuum formed by its condensation, causes fresh portion of vapour instantly to supply the void, so that great rapidity of action is kept up.

"It is manifest, that the temperature must be uniform, and that no greater degree can be communicated than the boiling point of the fluid medium chosen, and all injury to the machinery is, therefore, wholly avoided, while from the same cause, all those sudden accessions of elastic force which have frequently proved so disastrous, are rendered impossible.

"When the generating apparatus is used from day to day, it is found that the steam can be raised and the engine started *in seven minutes from lighting the fire*.

"This mode of heating continues to be employed with great success in operations where regulated degrees of heat are desirable, such as the preparation of vegetable extract; and in cases where a chemical necessity exists for the employment of vessels made of softer metals.

"Our diagram must be taken as merely illustrating the principle. It is evident that the form and arrangement of apparatus are susceptible of almost endless variety, so as to suit different objects and localities."

COMPARATIVE ECONOMY OF THE VAPOURS OF WATER, ALCOHOL, AND ETHER, WHEN EMPLOYED AS MOVING FORCES.

In giving the following report of a discourse by Mr. Ainger, delivered at the Royal Institution, on the abovementioned important subject, we cannot but regret that he should have omitted to furnish some *experimental* illustrations in support of his reasoning. Betancourt, and other acute philosophers, tell us that they have *proved, by direct experiment,* that the vapour of alcohol (for instance) does exert *double* the expansive force of the vapour of water at the *same* temperatures. If, therefore, like quantities of fuel are required to produce those equal temperatures, no other fact or circumstance seems to be necessary to come to the conclusion that the force derived from the vapour of alcohol is doubly advantageous over that of water—provided, of course, that the machinery of each be rendered equally perfect and convenient for applying the power. In making these preliminary observations, we beg, however, to be understood as not wishing to detract from the merit of Mr. Ainger's investigations, which, we must confess, deserve more attention than our time has enabled us to give them. The subject is one of real importance, and we shall be much gratified in receiving from our readers communications in elucidation of it.

Mr. Ainger, in a notice on the 'Economy of the Steam Engine," alluded to the misapprehensions which had at various times existed, as to the saving of fuel which would result from substituting ether or alcohol for water, as the vaporizable material; and he endeavoured to show, that a very simple calculation applied to the known facts, in regard to those substances and their vapours, would have prevented those misapprehensions, and would, indeed, have furnished the same results as have been obtained from experiment. The reasons usually assigned for proposing to use these liquids instead of water, have been the lower temperature at which they assume the state of vapour of a given elastic force (alcohol, for instance, boiling at about 170°, and ether at about 100°); and, also, the smaller latent heats of their vapours, as compared with steam. The boiling point of a liquid, and the latent heat of its vapour, form, however, only a small part of the consideration required for calculating its economy. The cost of a certain quantity of force derived from a given bulk of liquid, depends on the boiling temperature, the specific gravity, and the specific heat of the liquid, and, on the latent heat, the actual weight, and the specific gravity of the vapour. These being known, the relative costs of a certain quantity of power derived from two or more liquids may easily be deduced, as in the following comparison between water, alcohol, and ether.

It may be assumed, that these substances are all supplied to the engineer at the same temperature, say 50°. To raise them to their boiling points, they will require the following additions:

	Boiling Point.
Water......	212 — 50 = 162
Alcohol.....	170 — 50 = 120
Ether......	100 — 50 = 50

Multiply these numbers by the specific gravities of the liquids, respectively.

Specific Gravity.
162 × 1000 = 162,000
120 × 800 = 96,000
50 × 740 = 37,000

These results would require to be multiplied by the specific heats of the three liquids; but, as the specific heats are not very perfectly ascertained, and, as far as they are known, do not appear to differ very considerably; and, further, as the cost of heating the liquid forms a small part of the whole expense, the specific heats may be safely neglected, leaving the numbers, 162, 96, and 37, to represent the expense of elevating to the boiling temperature equal volumes of water, alcohol, and ether.

The cost of vaporizing them will be given by multiplying the actual weights (represented by their specific gravities) of the three liquids by their latent heats, which are about 1000, 450, and 300.

	Weight.	Latent Heat.	
Water......	1000 ×	1000 =	1,000,000
Alcohol	800 ×	450 =	360,000
Ether	740 ×	300 =	222,000

Add these numbers to those representing the cost of heating up to the boiling points, respectively:

$$162 + 1000 = 1162 \text{ Water}$$
$$96 + 360 = 456 \text{ Alcohol}$$
$$37 + 222 = 259 \text{ Ether}$$

then the last results will express the whole cost of vaporizing equal bulks of the liquids in question; the advantage, so far, appearing greatly in favour of the ether and alcohol, as compared with water. But it is now necessary to introduce another element into the calculation, namely, the specific gravity of the vapour, or the volumes of vapour produced from equal volumes of liquid. These are nearly as the following numbers:

Water..........	1700
Alcohol	610
Ether	300

That is to say, one cubic inch of water becomes about 1700 inches of steam, at atmospheric pressure; and single cubical inches of al-

cohol and ether become 610 and 300 inches, at the same pressure. The quantity of power is obviously as the bulk of the vapour, and the cost is of consequence inversely as that bulk. If, therefore, the cost of vaporizing be divided by the bulks of vapour respectively, the quotients will represent the relative expense of equal units of power derived from the three liquids.

$$1162 \div 1700 = .6714 \text{ Water}$$
$$456 \div 610 = .7475 \text{ Alcohol}$$
$$259 \div 300 = .8633 \text{ Ether}$$

From which it appears, that, independently of the original cost of the liquid, supposing, indeed, that alcohol and ether were supplied spontaneously, as accessibly, and at the same temperature as water, even then water would be the most economical source of power.

From this it appears, that the temperature at which a liquid vaporizes, and the quantity of latent heat absorbed in the process, form no criterion of its eligibility for the production of mechanical force; and that, therefore, there is no reason at present to expect that power can be obtained from liquid carbonic acid gas, or any other of the gases liquefied by Mr. Faraday, more cheaply than from water, merely because of the low temperatures at which they become highly elastic. Analogy, it is evident, would lead to a conclusion exactly the reverse, and would induce an expectation that the vapour of mercury, or even of metals vaporizing at a much higher temperature, would furnish the most economical motive power.

Mr. Ainger then described a mode of increasing almost indefinitely the power, or, in other words, of decreasing almost indefinitely the expense of the steam-engine, which has not hitherto been suggested, and which appears to require for its realization only the discovery of a succession of liquids, whose boiling points should differ about 100° of Fahrenheit; whose nature should not alter by repeated distillation; and which should exert no injurious action on the substances composing the machinery of the steam-engine. The difficulty of finding such a series of liquids is probably insuperable; if it were not so, there can be little doubt that the cost of steam power would be susceptible of an immense reduction. If, for instance, a succession of liquids could be obtained, whose boiling points were 612°, 512°, 412°, 312°, and 212°, and if the furnace were applied to the first, and its vapour were employed to work a condensing engine, it is clear that the vapour which was condensed at 612°, could be made to evaporate the second liquid, by condensing the first on the surface of the vessel containing the second, the vapour of which would, in its turn, work a steam-engine. The condensation of the second vapour at 512° might, in like manner, evaporate the third liquid, which boils at 412°, and so on, till the water which boils at 212° was evaporated, and which might be condensed by injection in the usual way.

It may perhaps be thought that a cooling surface at 512° will not sufficiently reduce the tension of a vapour at 612°, to leave any effec-

tual difference between the pressures on the two sides of the piston; but it must be recollected, that a depression of 100° reduces the elastic force of a vapour produced at 612°, as much as of one produced at 212°. The elastic force of common steam at 112° is equal only to 2½ inches of mercury; the elastic force, therefore, of the vapour produced at 612° would, when cooled to 512°, be also equal only to 2½ inches of mercury. There is, it must be confessed, a difficulty in condensing by mere contact with a metallic surface, as compared with condensation by an injection; but this difficulty would, in the proposed case, be much less than in the various schemes which have been projected to use alcohol, ether, and liquid carbonic acid, because in the former it is proposed to cool a less easily vaporized substance by one more easily vaporized; whereas, in the latter cases, water, which has been the intended cooling material, is less easily vaporized than the substances it is required to cool; a circumstance obviously unfavourable to the production of the effect. But for this difficulty, it is probable that the heat employed to vaporize water might, by the condensation of the steam, be transferred to alcohol, and from this again to the ether; but the question then arises, how is the heat to be abstracted from the ether; we have no other means than the contact of a vessel containing cold water, a means which is found insufficient for cooling common steam, and which would, therefore, be doubly inefficient in cooling the vapour of ether. These considerations will suggest other difficulties in the construction of engines to use alcohol and ether, beyond the absolute defect of economy, which has been before explained.

IMPORTANT EXPERIMENTS IN EVAPORATION.

TO THE EDITOR.

Sir,—My pursuits being connected with processes requiring quick and copious evaporation, I have been led to experiment upon the subject, and perhaps the result of my investigations may not be uninteresting to some among your readers.

I have long been aware of the great efficacy of conducting evaporation upon a large scale, on the reverberatory plan, the heated air which passes over the liquid, carrying off the rising vapour with great rapidity, but until I saw an account of a recent patent for the process it never occurred to me, that a strong current of air forced *into* the fluid, would be productive of still greater rapidity, and so soon as I saw the description of this patent I lost no time in putting it to the test and comparing its results with other modes of evaporating.

My experiment was a very simple one, and may perhaps not be thought the worse of on that account. I first put a known quantity of water into a small vessel, and heated it by a powerful chemical lamp. I noted carefully the time when it began to boil

and suffered the ebullition to continue for a given time, when I removed the lamp and measured the remaining quantity of water.

I next measured into the vessel the same quantity of water as in the first operation, and when this had reached the boiling point, atmospheric air was forced into the water, and within a very small distance from the bottom of the vessel, in such quantity and with so much force, as nearly to blow the liquid out of the vessel; the boiling was by this means effectually checked, and when the blowing had been continued for the same period of time as the boiling in the first experiment, the lamp was again withdrawn and the remaining quantity measured.

I then proceeded with another equal quantity of water in the same manner, but substituting for the blowing, mechanical agitation, which as well as the current of air checked ebullition, and after this operation had been continued for an equal length of time, the lamp was removed and the remainder of this quantity was measured.

I give you here the result, which I own has somewhat surprized me, so much so indeed, that I judged it necessary to repeat the experiments at two several times, lest I should have deceived myself with regard to it. But as the effect was always in the same relative proportions, the fact appears to be established.

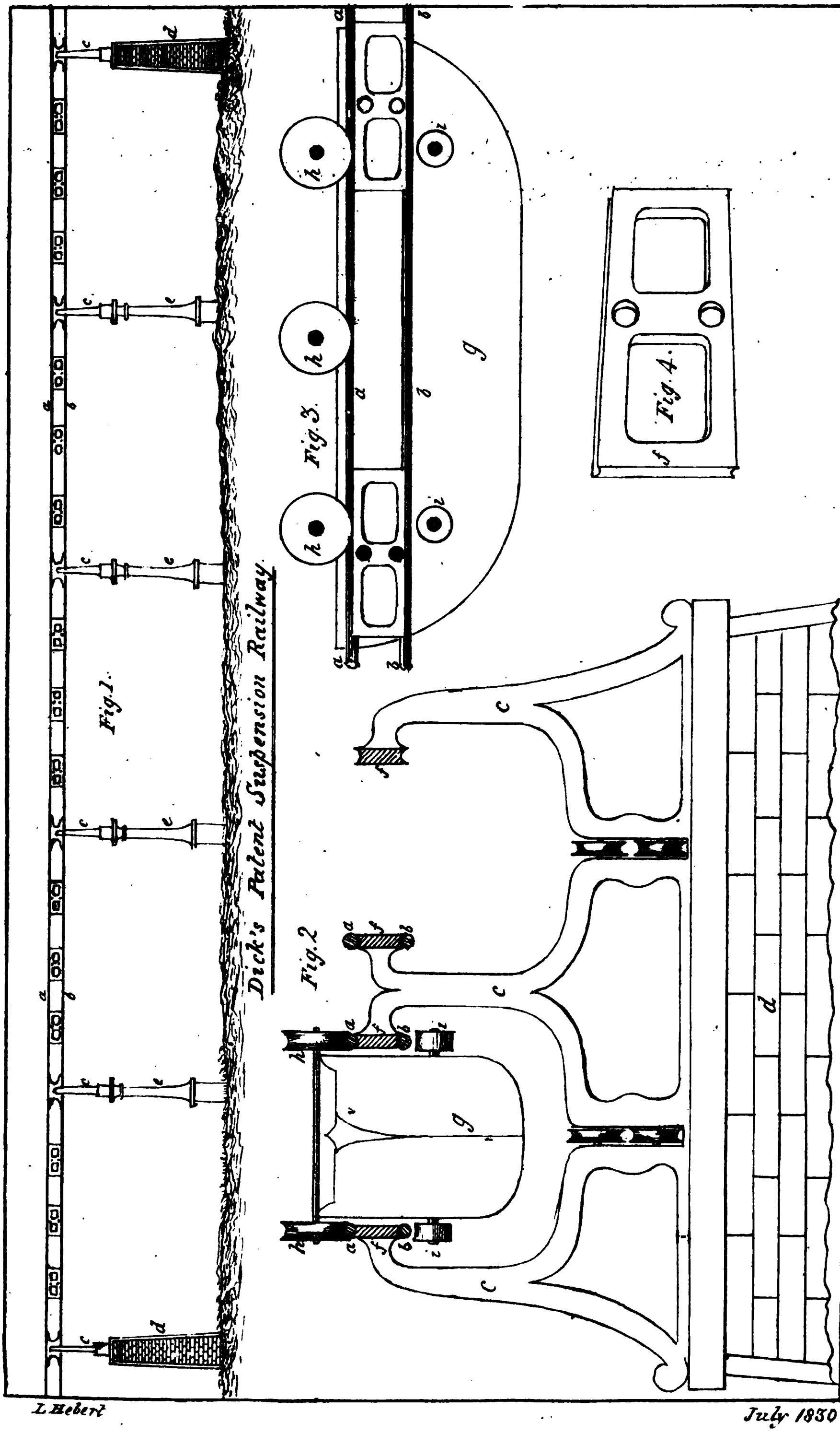
In the first operation, that of unaided evaporation, the diminution of quantity may be represented as	1·375
In the second operation, where the evaporation was assisted by the current of air forced into the liquid, the diminution was	1·750
In the third operation, where mechanical agitation was used, the diminution was	2

The lowering of the temperature in the second and third operations appears to be owing to the increased evaporation carrying off heat with the vapour more rapidly, that it is communicated from the lamp, this at least would seem to be the case *altogether* where the mechanical agitation was used; in the other process, the temperature doubtless was reduced also by the volume of cold air forced into the fluid.

I am, Sir,

Your humble Servant,

19*th June*, 1830. E. N. R.



Dick's Patent Suspension Railway.

L. Hebert

July 1830

DICK'S PATENT SUSPENSION RAILWAY.

TO THE EDITOR.

SIR,—Having had an opportunity of inspecting the models of Dick's Patent Railway, now exhibiting at Charing Cross, and entertaining a very high opinion of its merits, I am desirous, as a regular Subscriber to the Register of Arts, that it should contain a more particular description of the invention than that which you have already favoured your readers with; and as it may possibly be saving you trouble, I enclose some sketches and an explanation which you will perhaps do me the favour of inserting.

Whatever may be the surface of country, whether rising or falling, over which the railway may be placed, matters not; even the crossing of rivers, mosses, marshes, &c. will be no barrier.

The line being surveyed, it will then be necessary to erect pillars of stone and lime, at given distances, suppose fifty yards. Between each of these there may be placed four or five cast-metal pillars, as occasion may require, for the purpose of adding strength, as well as for keeping the rail completely free from any undulating effect.

The pillars being erected, the next thing necessary is to fasten a frame on the top of each, for the purpose of securing the rails. These frames may be either of cast or wrought-iron; and are to be furnished at top or at bottom, (just as the line of pull may be, whether rising or falling,) with vertical, grooved friction-wheels: and into these wheels, from the particular shape of the frame, the drag-line, (afterwards described) is always directed.

The rails I intend should be made of the best rod-iron, such as is used in the manufacture of chain-cables—of a diameter suited to the strength required, and in lengths as long as possible, which may be screwed, welded, or otherwise put together, so that the whole, from frame to frame, or from stage to stage, (whichever may be deemed most secure,) may form one uninterrupted length of rail. But lest the screwings or other joinings should weaken the rails, there may be added a strap of iron to the inner part of the rail, so as to make up the deficiency in point of strength. Each line of rail should be done in the same way; and the whole fastened down securely upon the frames, with pins, bolts, screws, or otherwise, the holes for which to be staved, so as to secure the entire strength of the iron; and the heads to be countersunk, or finished, so as to render the whole-top-surface of the rail smooth, and free of all opposition to the wheels of the carriages. Between each frame there is also introduced three or four cast-iron braces, in order to stiffen and entirely prevent any vibration or undulation of the rail.

The method proposed for dragging the carriage along the railway is, by fixed or stationary engines, acting with drag-lines or ropes attached to the carriage, which, if the railway be double, (as in the accompanying drawing) will act in an endless round; but if the line of railway be single, then the engine will be interchangeable and reciprocal.

Reference to Drawings.—(Plate III.) Fig. 1, represents a side elevation of one span of a double suspension railway; supported at

the extremities by a pier of masonry, *d d*, and at equal distances between by four cast metal pillars, *e e e e*; *a* is the upper or "*bearing-rail*," *b* the lower or "*safety-rail*," which are bound together by intermediate "*stay-braces*," better shown, on a larger scale at *f f* in figures 2, 3 and 4.

Fig. 2. Shews a front elevation of a frame *c c c*, for a double line of rail, with a carriage on one of them at *g*. The letters of reference in this figure, as in all the others, designate similar parts, it therefore need only be said, that the stay-braces *f f* are seen in section between the rails *a* and *b*.

Fig. 3. Gives a side elevation of a carriage on a portion of rail; *h h h* being the running wheels, and *i i i* the anti-friction rollers which prevent the carriage from being thrown off the railway. On examination of fig. 2 which exhibits the end view of this carriage, will fully explain its form and construction.

Fig. 4, Is a perspective sketch of one of the stay-braces on a larger scale.

The expense of one mile of railway on this principle is calculated at £1395 10s. 6d. The advantages contemplated are stated by Mr. Dick as follows:—"In the first place, as you save distance, so do you save time; which, all must admit that, in a commercial as well as in a political point of view, is of the utmost importance. The suspension rail takes a straight forward point from one town to another, without regard to the surface of country over which it has to go, whether rising or falling, crossing of rivers, or otherwise. All are, by regulating the heights of the pillars, with the same ease gone over; and by that means, saving of distance, saving of surface ground, saving bends in the formation of the rail; which bends, besides the extra expense of originally laying, are always liable to great derangement from the lateral friction of the waggons coming round them, compared to that of a straight line of rail.

Secondly, the suspension railway over that of the ground railway has another immense advantage—that is, as far as expense is concerned; which is in the saving of all embankments, excavations, building of bridges, cutting of tunnels, besides the great breadth of surface ground.

Thirdly, and which I think the most important of all, is the great dispatch to be gained by the suspension railway, without in the least degree endangering either persons or property, its height being sufficient at all places to allow every agricultural and commercial intercourse to go on under it without interruption; and then the carriages being so completely locked within the rail, prevent any chance of their escape, whatever may be their velocity: so that I do not stretch a point when I say, with light carriages containing the mail and all small packages, a velocity of sixty miles an hour is to be obtained, including all stoppages, and that with the greatest ease and safety.

(Want of space obliges us to defer inserting the remainder of this letter until our next.—EDITOR.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for a "Pendulous Rail-road Car," for running or moving upon rail-roads. Granted to Samuel T. Jones, *Philadelphia, Pennsylvania, February* 22, 1830.

To all whom it may concern, be it known, that I, Samuel T. Jones, of the City of Philadelphia, in the State of Pennsylvania, have invented an improved car, which I denominate the Pendulous Railroad Car, for running or moving upon rail-roads, in which are combined, simplicity of construction, facility of being loaded or unloaded, and of turning upon a curved road; and that the following is a full and exact description of my said invention or improvement.

The body of the car may be constructed of iron, wood, or any other suitable material, and in any form which may be preferred. This I suspend upon two wheels, which is the distinguishing feature of my invention. In order to effect this, I suspend the car in such way, that whether loaded or not, the centre of gravity of its body, when in its upright and proper position, must be below the point or points of suspension. An axle common to each wheel, and revolving with them, may be made to pass over the top of the car, or through the sides thereof; and in the last-named case, should be enclosed within a box or tube, extending from one side of the car to the other, to protect the axle from being obstructed in its motion by the load; or a frame may be made of wood, or other material, which shall surround the car, so as on each side, to receive a wheel between two cheeks, so that its axle or gudgeons may be carried and revolve in proper boxes contained in, or attached to, said cheeks; the car being attached to and swinging with the frame, upon the axles or gudgeons as joint bearings. Instead of attaching the points of suspension directly to the sides of the car, I intend, sometimes, to extend a spring, or a bar, along each side of its body, and firmly affixed thereto by its two ends, and to make this spring, or the bar in its central or middle part, the point of suspension; in which case the bar is intended to operate as a spring, and to lessen the vibration of the various parts of the car.

When the car is at rest, for the purpose of being loaded, or unloaded, bolts or props may be made to shoot out, or to turn down, from the ends or sides of the body of the car, and to rest either upon the rails or path, so as to hold the body steady; these when desired, may be made to project sufficiently to tilt the car towards either end, and thus bring it nearer to the ground, to facilitate the loading or unloading. These props may be constructed in various ways, two of which are shown in the drawings deposited in the patent office.

The wheels of these cars may be made five or six feet in diameter, and still the load may be lower down than in ordinary rail-road carriages, or even more than this, and the same purpose be effected.

The cars may be attached to each other, so as to form a train, by bars or chains, in the usual way; but in order to lessen their vibrat-

ing, or pendulating, upon their points of suspension, when in progressive motion on the road, and to increase the steadiness of the wheels upon the rails, I intend, in general, instead of chains, to attach them by a clevis, which shall work in loops or eyes, in the ends of the cars, so as to allow of a horizontal hinge motion, at one end of the clevis, and permit the cars to turn readily upon a curve in the road, thus acting like the bolt in the bed of an ordinary carriage or waggon.

Friction wheels of the various forms now in use, may be employed and attached in the ordinary way, which making no part of my invention, I do not describe. What I claim as new in the above described cars, is the adaptation of a two-wheeled vehicle to a rail-road, by suspending the body of the car, and its load, so that the centre of gravity may be below the points of suspension, and the car thereby made to hang in an upright position by its own weight; of being tilted towards either end for the purpose of greater facility in loading or unloading, and answering other useful ends.

Samuel T. Jones.

Fig. 1, Plate IV. The flanches are here supposed to be on the inner edges of the wheels, and the wheels running in a frame *a a a a*, without an axis common to both wheels. *b b* bolts or props, to steady or tilt the car, whilst loading or unloading.

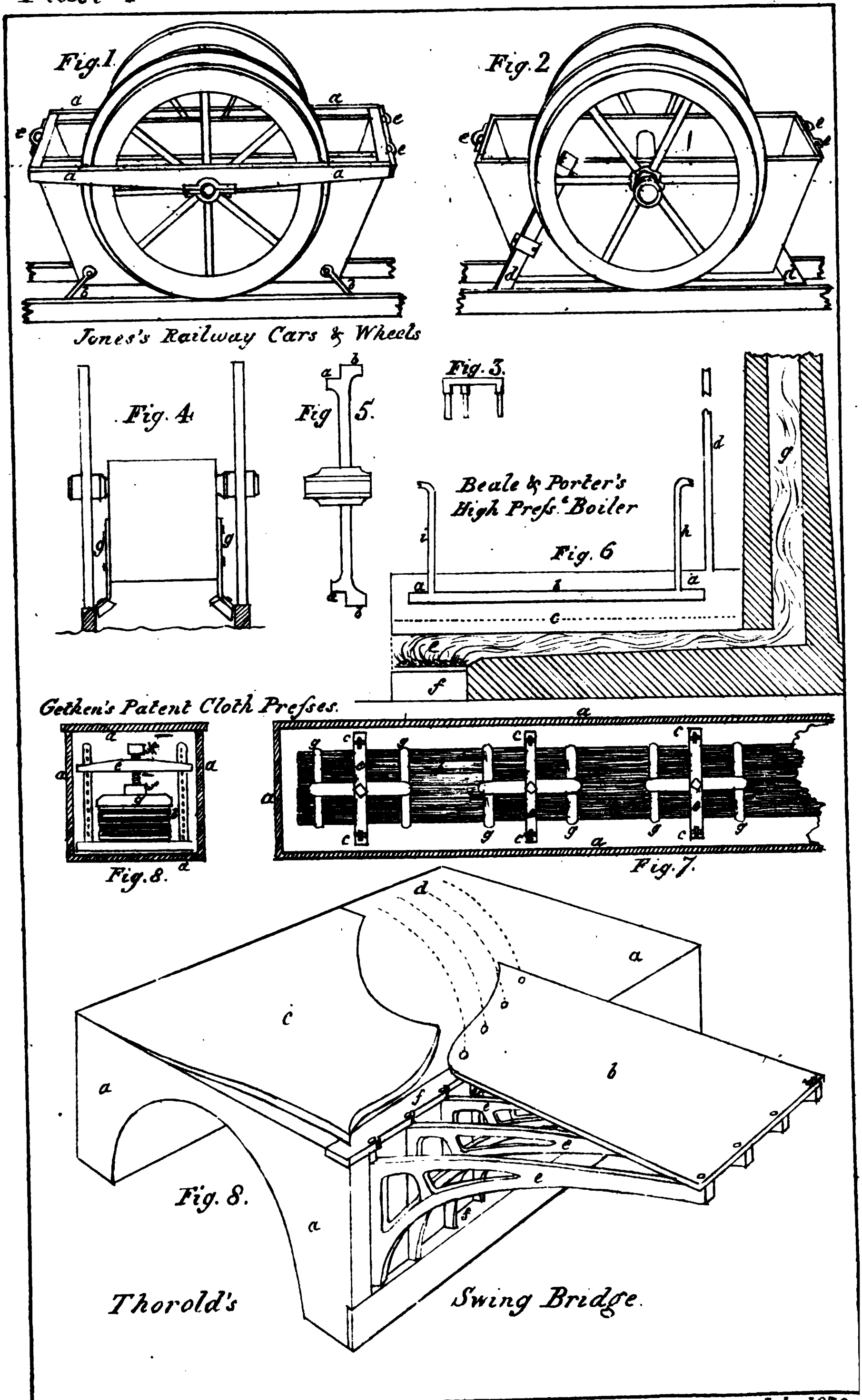
Fig. 2. In this the axis crosses the car, and is boxed over. *d d* show sliding bolts or props, to answer the purpose of those at *b b*, fig. 1.

Fig. 3. Is a form in which the clevis, to connect the cars, may be made; the three shanks dropping into tubes or loops, two into one, and one into another car. The loops are seen at *e e e*, figs. 1 and 2.—*Journal of the Franklin Institute.*

Specification of a patent for modes of adapting Rail-way Cars, or Carriages to run on ordinary roads or streets, and also of enabling Carts, Waggons, and Carriages of various kinds, to run securely upon rail-roads. Granted to Samuel T. Jones, *of Philadelphia, Pennsylvania, February* 22, 1830.

To all whom it may concern, be it known, that I, Samuel T. Jones, of the City of Philadelphia, in the State of Pennsylvania, have invented a new and useful mode or modes of adapting rail-way cars or carriages, to run on ordinary rods or streets, and also of enabling carts, waggons, and carriages, of various kinds, to run securely upon rail-roads; and that the following is a full and exact description of my said invention.

The main difficulty in converting a rail-road car or carriage into one for common roads, is the structure of the wheels, which, on rail-roads, require flanches, or some substitute therefor, which renders them unfit for other roads; and, in like manner, carriages for ordinary roads, for want of these appendages, will not run upon rail-roads. To obviate these difficulties, I have invented and adopted the fol-



L. Hebert

July 1830.

lowing plans, which may be applied either to my pendulous rail-road car, or to any other car or carriage for rail-roads.

I sometimes make my wheels without flanches, and instead thereof, use friction rollers fixed upon, or adapted to, suitable arms or bearings, extending down to the rail, so that the rollers may bear against its side, and perform the office of a flanch. The application of friction rollers is not new, but instead of making the arms, or bearings, or the rollers, fixtures, I construct them so that they may slide up, when the car or carriage is about to pass off the rail-road, and bring the rollers nearly or quite into contact with the body of the car; or to swivel upon a joint or joints, so as to turn up on the ends of the car or carriage, and in these positions be secured by any convenient means, so that they will not be liable to meet the usual obstructions on the surface of the common roads. These may be fixed in various ways, two of which, deemed by me as among the most eligible, are represented in the drawings deposited in the patent office. Sometimes I construct the axles of the friction wheels or rollers, so that they may easily be withdrawn from the bearings, and remove the wheels or rollers only, without disturbing the arms or bearings, for said purpose.

The novelty which I here claim, is the attaching the arms, bearings, or axles, which carry the friction wheels or rollers, in such way, as that they can be readily removed, and thus prevented from coming into contact with the ground, which they would if they were fixtures, in their usual acting position, when desired to pass off the rail-way.

Another mode by which I convert the rail-road car or carriage into one for common roads, is by using them with flanches to the wheels, of nearly the ordinary form, but which also are capable of being removed, or unshipped when they are to pass off the rail-road. This may be effected by screws, bolts, buttons, spring catches, or other means equally easy and secure, to which I could lay no claim, my invention being simply the removing or attaching the flanches for the purpose above specified.

It will readily be perceived that in this case, the flanch is to be disconnected and separate from the tire or band surrounding the wheel, which latter is intended to be a fixture. The flanch may be either of cast or wrought metal, but in this, and in all cases, wherein the car or carriage is to be adapted for passing off the rail-road, if the wheels are of wood, I recommend the tire or band aforesaid to be of rolled or wrought metal.

A simple and easy mode of securing the flanches to the wheels, and allowing of their removal without loss of time, is the following. A suitable number of holes are to be made in that part of the hoop or ring, which covers the side of the wheel, and of which the projecting part, when on, forms the flanch. On the side of the wheel there are to be a corresponding number of hooks, catches, or buttons, which will pass through said holes, so that when the flanch is hung upon them, they will hook or lap over the outer edge of the holes, by the falling of the flanch into the hooks or notches, or catches, pre-

pared for that purpose; a single bolt now passed through the flanch or rim, and wheel, and secured by a nut, catch, or key, will secure the whole firmly together, and also allow of their being separated again with the utmost facility. The hooks, catches, or buttons, may, if preferred, be fixed upon the flanch piece, and pass into holes in the wheel, and there lap into and become tied, and then be secured by a single bolt passing through the flanch or rim, and wheel, as before mentioned. The hooks or catches may themselves be made to take off, when the car or waggon is intended to leave the rail-road.

Where frequent shifting is not necessary, bolts and nuts may be used, instead of any other contrivance. The hooks or catches before named, may be made to tighten upon the flanch by means of nuts. I do not, however, confine myself to the modes designated, but to secure the flanch by any method by which this can be readily done, and at the same time admit of its easy removal.

In order to adapt common carts, waggons, and other similar vehicles, or pleasure carriages, to rail-roads, when the faces, tread, or tires of their wheels are sufficiently true, and of a proper width to run or move upon rail-roads, I attach either moveable friction wheels, or flanches to them, as above described, and affix them either on the outsides or insides of the wheels, according to the structure of the rail-road on which they are to run.

When the wheels are in any way defective or deficient in the face, or tread, for running upon a rail-road, I place a rim, covering the face of the wheel, and also forming a flanch, so as to enclose and surround the wheel, and give to it the form and attributes of a wheel for a rail-road, and attach and secure it to the wheel by means similar to those already described. In case of a waggon or other ordinary four wheeled carriage being adapted to a rail-road, the fore axle, which works upon a pin or bolt, may be secured to the carriage by another bolt or tie, so as to convert it into a fixed axle.

I intend sometimes to widen the edge of the ordinary flanch, so that when it leaves the rail, the edge shall serve as a tread or face for ordinary roads.

What I claim as new, and as my invention or discovery, is the attaching a moveable flanch or flanches, or of shifting friction rollers operating as flanches to rail-road cars or carriages, in lieu of fixed ones as at present employed, for the purpose of adapting them to rail-roads when the rollers or flanches are in their places, and to common roads when they are removed; and also the attaching of such rollers and flanches, or a complete rim forming a face or tread, and flanch to carts, waggons, or carriages, intended for ordinary roads, so as to fit them for running upon rail-roads. I likewise claim the widening the edge of the flanch so as to become a face or tread, suitable for streets or common roads.

SAMUEL T. JONES.

Fig. 4, Plate IV, exhibits an end elevation of a rail road car, which is kept on the rails *a a*, by means of the anti-friction rollers *b b*,

which turn on the extremities of the slide bolts *c c*. It is evident, that upon drawing up the slide bolts, the wheels of the car may then run upon the common road without any obstruction.

Fig. 5, Plate IV, shews a section of a wheel, and the manner in which a flanch may be widened so as to serve as a face or tread on ordinary roads;—*a a* being the tread for the rail road, *b b* the tread for the common road.

There are six other diagrams attached to this specification, but the nature of them will be sufficiently understood by the text.

We annex Dr. Jones's remarks on the two foregoing inventions with the utmost respect to his opinions, but we think it very doubtful whether the introduction of such large wheels on *rail* ways, will be attended with advantages, that will compensate for the disadvantages, of their being made about *six times heavier* than those of the ordinary kind mentioned.—Ed. Register.

Remarks by Dr. Jones.—From frequent conversations with the gentleman who has obtained the two preceding patents, we have been fully informed of the advantages which he anticipates from his inventions. Most of these are apparent from the tenor of the specifications, particularly of that for enabling carriages to run either upon rail, or common roads. In the pendulous car, it is believed, that by substituting wheels of from 5 to 6 feet in diameter, for those of 2 or 2½ feet, as now employed, the motion of the car will be much more steady, and attended with less jolting at the joinings of the rails; as those inequalities will be much more readily surmounted, which, though small, are inseparable from structures of this kind, and produce a perpetual vibration. The friction on the axle will also be decreased in proportion to the increase of the size of the wheel, and the extent of rubbing surface will also be lessened from the cars resting upon two bearings instead of four. The ease of loading and unloading will be greater than in the common car, as, notwithstanding the size of the wheels, its body may be placed nearer to the ground than has heretofore been practised, and by means of the bolts or props, one end be brought into direct contact with it. It is not believed, that on a rail-road, any inconvenience would be experienced from the pendulous motion of a single car. This, however, is a point of little importanee, as a single horse, would of course, draw several of them, and the mode of connecting them would prevent all vibration upon their axis, whilst it offers every facility to their adapting themselves to any curve.

The capacity of each car may be nearly or quite the same as those with four wheels; and from the weight hanging so much below the axle, the lateral strain upon the wheels will be greatly lessened. *Ib.*

REPORTS OF AMERICAN PATENTS.

For an improvement in Bramah's Hydrostatic Press. David H. Mason and Matthew W. Baldwin, *Philadelphia, Pennsylvania, December 2.*

The patentees say, that "in our improved press the main cylinder, and the plunger, or piston, are constructed as formerly; the principle upon which the instrument acts, also remains unchanged, our improvement consisting in such an arrangement of the forcing pump or pumps, and its or their appendages, as shall give to them greater stability, and render them more compact, and less liable to get out of order, in consequence of the greater simplicity of their parts; thus fitting them the better for general use, and affording them at a reduced cost."

The claim is to "the using of the main cylinder, or the plunger, as a stand or support to the forcing pump or pumps, with their appendages; thereby dispensing with the separate stand ordinarily employed; by which arrangement, one joint suffices for the attachment of the pump or pumps, without the intervention of a pipe or tube."—*Franklin Journ.*

For an improvement in the mode of Distributing Ink, and applying the same to the types in Letter-press Printing. John Prince, *New York, December 3.*

Some idea of the construction of this apparatus may be obtained from the account of its operation, and the claim. Two drawings accompany the description, and give a very clear exposition of the whole structure.

"*Operation.* When the carriage of the press is run in and out by means of the rounce, the spring that communicates the power for taking ink, distributing, and carrying the inking roller over the types, is wound up. When the tympan is raised, a ketch is lifted, that lets the spring operate in moving the upper roller over the types, and when put down, is again locked.

"Thus, without any other attention from the workman than that of adjusting the screws for regulating the quantity of ink, the whole business of putting the ink on the types is performed by simply turning the rounce, and running the carriage out and in.

"What I claim as my invention, and wish to secure by patent, is the above described machine, and the peculiar mode of winding up the spring by means of the rounce in running the carriage out and in, by which motion is given to the inking rollers, and conveying them over the types."—*Ibid.*

For an improvement in bolting Flour and Meal, by means of a "Vibrating Bolt. William Henry Aikins, *Berkshire, Tioga country, New York, December* 3.

Instead of a revolving frame and cloth, as in the common bolter, a box is used of about five feet in length, ten inches in width, and one inch in depth. This box is covered at top with a strong cloth, and on the lower side with bolting cloth; it is suspended from the top of the bolting chest by means of four ropes, one at each corner. A shaft extends along the outside of the chest, and two pitmen, one at each end of this shaft, gives a vibratory motion to the bolter.

The meal is passed into the bolter through a bag open at both ends, passing through the top of the chest, and into the upper end of the bolter.—*Ibid.*

In our opinion this will be found a very effectual machine, and it has the signal advantage of being easily and cheaply made. The vibratory motion agitates more than the continuous rotary action, and is, therefore, calculated to prevent the clogging or stopping up of the interstices in the bolting cloth.—Ed. Register.

For an Improvement in Percussion Primers for Cannon. William H. Bell, *Lieutenant in the United States Army, Fortress Monroe, Virginia, December* 8.

The powder used is the ordinary percussion powder. The primer is made of the thin sheet lead, used in chests of tea; its form, when finished, is that of the segment of a sphere. The claim is to the "making the primers in the form of the segment of a sphere, and in using thin sheet lead to enclose the percussion powder."

It is stated by the patentee, that "these primers have been tested by about 500 discharges of a 24 pounder, with single and double shot, and when used with my percussion lock, produce the utmost certainty of fire in discharging artillery."

Lieut. Bell's lock is not described, nor are we informed what is its particular construction. It may have been the subject of a former patent which we have not seen.—*Ibid.*

For a Machine for elevating heavy Guns. William H. Bell, *Lieutenant in the United States Army, Fortress Monroe, Virginia, December* 8.

The gun is to be elevated by a vertical rack, the upper end of which forms a round head, which acts in a socket at the lower side of the pointing board. An endless screw works into a toothed wheel, which turns a pinion, mashing into the rack. The shaft upon which the screw is formed stands across the gun carriage, and is turned by a crank.—*Ibid.*

For an Improvement in the art of Charring Wood, for the manufacture of Charcoal. Isaac Doolittle, *Bennington, Vermont, December* 14.

Permanent kilns are to be built of masonry, of such capacity as may be desired. The walls may be run up to the height of eight or ten feet, and surrounded at top by a strong band of iron; an arched roof or dome is then to be constructed. Vent holes are left at the bottom, and about the middle of the walls, and also in the centre and other parts of the dome. Chimneys or flues are also built around the walls. Door ways are left to charge with wood, and to remove the coal. These may be closed with iron or with masonry. Stoppers are adapted to the various vents, so that they may be partially or perfectly closed.

The claim is to "the construction of permanent kilns above ground, with arched roofs, chimneys, and vent holes."

It is stated, that "by the addition of a simple apparatus, this method of charring wood may afford vast quantities of pyroligneous acid, which may be applied to various uses in the arts." In situations to which wood can be transported with facility, there can be no doubt of the economy of the plan proposed; and that the quality of the coal will be much better than that burned in the usual way, we have no doubt.—*Ibid.*

ON A NEW METHOD OF COLOURING OR ORNAMENTING STEEL.

By M. Leopold Nobili, of Reggio, in Italy.

In the "*Bulletin de la Societe d' Encouragement,*" for January, 1829, is contained a report made by M. Gualthier de Claubry, a member of that Society, as follows:

"A learned foreigner, known by his ingenious researches, M. Leopold Nobili, having presented to this society the results of his experiments relative to a new art, to which he has given the name of *metallochromie;* you charged your committee of the chemical arts to examine these products; and I have, in its name, to report thereon.

"A great number of experiments, more or less successful, have been made by various persons, and at different periods, to apply in a solid manner, paintings upon metals; but the solidity of the pictures did not equal their wishes, and the thinness of the colours applied rendered their traces vague, and greatly diminished the sharpness and finish of the designs.

"M. Nobili has lately, by his assiduous researches, and the labour of many years, produced by a process which he has not made known, designs upon various metals, in which the brilliancy of the colours,

and the harmony of the tints, leave nothing to be desired; thus these colours possess none of the inconveniences above stated; and they are developed upon the surface of the metals without being too thinly diffused; but are stable, and will not disappear unless by the application of a high red heat, which. by its action, would also destroy the surface of the metal, as well as the chemical agents employed upon it.

"Nothing can be more brilliant and singular than the colours upon M. Nobili's plates, especially by day-light; and all his designs are executed with a fine taste, the regularity of their forms, and the sharpness of their outlines, being all that can be wished.

"M. Nobili has not merely manufactured these plates as objects of curiosity, but has mounted several, which have been singularly esteemed by amateurs; and we can readily believe that this pleasing art would meet with great success were it carried into effect on a proper scale; and it is, therefore, much to be desired that so new and curious an art should not be lost to France, and especially as M. Nobili appears disposed to bring it into practice. We can easily form a just idea of the extent to which it might be possible to carry this branch of manufacture, when we remark that many metals assume their colours in very different orders by the application of heat; and we can easily conceive, that in the hands of a skilful man, and one well conversant with commerce, the greatest advantages might be derived from the employment of this new branch of industry. Thus for instance, nothing presents more harmony than gold, as its tints are very different from those afforded by heating steel. It is upon this last metal that all the designs presented by M. Nobili have been executed. Silver likewise affords different colours on applying heat; and an experienced artist cannot fail to make many fine applications of M. Nobili's process.

"This process not being exactly known, many persons have accordingly formed suppositions, and even made experiments respecting it; but it does not appear that their suppositions have been well founded, and their success has been much less happy, and their colours less perfectly developed upon the surface of the metal, than can be effected by an art which has acquired perfection in the hands of M. Nobili.

"Under the impossibility then, of being able to speak positively as to the manner in which M. Nobili has been able to produce these curious effects, we can only applaud the incessant efforts which he must have made to bring his art into the perfect state in which we find it. All those who have attempted new branches of manufactures, may well conceive the difficulties which every day presents, and which can only be overcome by a continued zeal and efforts to surmount unsuccessful endeavours; and M. Nobili could not otherwise have arrived at the point of perfection to which he has brought his *metallochromie*, nor can he be too much praised for the success he has obtained.

"We again repeat, that it is much to be desired that so curious an art should not be lost to France; and the Committee of Chemical

Arts, in order to forward this object, have charged me to propose, that M. Nobili be recompensed for his interesting communication, by inserting this report in the *Bulletin* of the Society."

ON AN APPARATUS FOR EVAPORATING SIROPS.

[From Ferussac's Bulletin des Sciences Technologiques.]

This apparatus, which has been recently established in France, and for which the inventor has obtained a brevet, is chiefly remarkable for its great simplicity. A copper boiler, hermetically closed, and some wooden vessels, in fact, compose the chief part of the apparatus. The vacuum is made by steam, and the steam is afterwards condensed by cold water, so simple is the process. The apparatus does not require the employment of any pump, nor of any other auxiliary machine, as it performs its functions without motion. And thus, not only is the vacuum produced and preserved without the aid of the pneumatic pumps, which are employed in Howard's English apparatus, but the water necessary for the condensation, rises of its own accord into the reservoir destined to receive it, and which is elevated from eight to ten feet above the suurface of the earth. The management of the apparatus is also much less complicated than that of Howard; and thus a workman possessed of the least degree of intelligence can govern it; in fact, it is reduced merely to the turning of a few cocks! The steam is also produced under the ordinary pressure, which removes all idea of danger. The proofs are taken by drawing out the boiled sugar into threads, as usual; and an instrument is applied to the boiler, which permits us to extract a small portion of the sugar from time to time, and without suffering the air to enter the boiler. This instrument differs entirely from that used in Howard's process, it is not only more simple, but is also more convenient.

M. Leclerc, a manufacturer of sugar from the beet root, is the first person in France who has adopted this new apparatus at his sugar refinery, near Péronne. He employs the steam produced from a covered boiler, in which the juice is concentrated before it is clarified. This boiler thus serves as a steam generator. The steam thus produced heats the boiler (the vacuum pan of Howard's apparatus) in which the sirop is brought into a state of ebullition. The withdrawing of the atmospheric pressure from its interior, permits us to obtain this ebullition without heating the steam to more than eighty degrees of Reaumur's thermometer. The sugar boiling is thus effected at a temperature of from fifty to sixty degrees. It depends upon the workman to regulate this internal heat, and which he can raise or lower at will. Experience has however proved that it is necessary to elevate it to sixty-eight degrees towards the end of the boiling, in order to give the sirop the temperature necessary to produce a good crystallization of the sugar. This effect, however, is still obtained, without suffering the air to enter, or injuring the vacuum. The in-

ternal pressure is indicated by a mercurial gauge, which varies in its range according to the density which the steam has acquired. The exclusion of the air is perfect, and the vacuum is maintained without being perceptibly weakened during the whole course of operation, prolonged, as we see, many hours. Whereas, in order to produce a vacuum in Howard's apparatus, pumps are required which must possess a degree of perfection difficult to give them. M. Roth's apparatus is capable of being established upon any scale which may be required, and in all localities. The want of water need be no obstacle. Firstly, the quantity required is much less than that which is employed in the English sugar refineries, it is about a fourth part only; three litres and a half of water being required for each litre of sirop. And, secondly, it is possible, and even advantageous, not to replace that which has served for the condensation. On leaving the apparatus, it has acquired a temperature of from forty to forty-five degrees; and it is received into a reservoir, placed outside of the buildings. After arriving at this reservoir, its surface is not long in cooling. The tube of aspiration, intended to elevate it again to the apparatus, takes it from the bottom of the reservoir; this alternate motion of rising and falling may be continued with the same mass of water, for a longer or a shorter time; nay, it may be prolonged indefinitely, provided the water is not suffered to become putrid. This inconvenience may be avoided by saturating it with lime.

The vacuum pan in M. Roth's apparatus, evaporates from an equal surface, with much greater speed than an open boiler placed over an open fire. When established upon a proper manufacturing scale one pan will boil nearly 4000 litres of sirop daily.

We can believe, after what has been above stated, that the expense of establishing this apparatus cannot be great. According to report, it is beyond all comparison in this respect, with that of Howard. Its construction is solid and simple, and the absence of all friction renders the keeping of it in repair easy, and of course at but little expense.

The advantages which it presents are, first, to produce an economy in the heating; secondly, the boiling the sirops without weakening them, and thus affording better and more beautiful products; thirdly, making more sugar, and less molasses (about ten per cent;) fourthly, shortening the time of claying the sugar; fifthly, causing the inconvenient and noxious vapours usually produced from sugar refineries to disappear; and lastly, to procure a great quantity of hot water, applicable to various purposes.

CONSTRUCTION OF MAGNETIC NEEDLES.

According to M. de Legey, steel for magnetic needles should not be selected from amongst springs, for such steel is formed of fibres more or less hard, which, by the action of the hammer, has had different directions and unequal hardness given to them. M.

Legey prefers German laminated steel plate, from which he cuts a strip in the direction of the length, and then draws it out so as to close the pores till it is very brittle. From this plate he cuts the lozenge intended for the needle. All the operations should tend to lengthen the fibres in parallel directions. The steel is then to be hardened, after which it is to be moderately tempered, then polished on the wheel, and finally magnetized.

Before magnetizing the needle, it is examined, and usually found to have two poles. Whatever may have caused them, M. Legey regards the needle as more apt to receive magnetism, according to the position of these poles, than in any other direction, and, therefore, endeavours to preserve them in every operation to which the needle is subjected: thus, in the polishing, it should always be done in the direction of the length of the needles, and the southern poles should be held opposite to the course of the wheel, a proceeding which it is affirmed preserves the position of the poles. When the needle is magnetized, the same attention to its previous state is to be given.—*Bulletin de la Societe d'Encouragement.*

NEW SWING BRIDGE,

By Mr. Therold, of Norwich.

A model of this invention is placed in the National Repository, from which we made the perspective sketch of it, exhibited by fig. 8, Pl. IV. *a a a* may be considered to represent an abutment consisting of a dry arch of masonry; *b*, the moving platform, forming either the whole or a half of the roadway over the water; *c*, a portion of the surface of *a*, raised so as to fit flush with the curved part of the platform, when the latter is fully projected; the dotted lines *d*, shew the tracks made by a series of anti-friction rollers, which support one end of the platform *b*, the other end being connected to the four crane jibs *e e e e* by axle pins; the platform has in consequence a parallel motion. The axes of the crane jibs are fitted into strong metallic plates *f f*, that are built in the masonry of the abutment, where also recesses are made to allow the jibs to fold back flush with the wall.

This is an elegant and novel arrangement of parts for a bridge, and as a whole it seems to be well calculated to afford great strength and stability, both ends of the swinging part being constantly and duly supported.

MISCELLANEOUS ARTICLES.

The Chlorides of Lime and Soda, have been recently employed very successfully as disinfectors in cases of the plague. M. Parisot, who is at the head of a medical expedition to Egypt and

Syria, to ascertain the causes of plague and the effect of chlorides of lime on the infectious matter and pestilential miasmata, in a letter dated Tripoli, Syria, 28th June, 1829, says; " we left for that country, and after many delays arrived at Tripoli on the 30th of May; on the 31st, we took up our abode in the house of the French consul. When there, we requested six sets of dresses, (six shirts and six pair of drawers), in which persons had recently died of the plague; these, some of silk and some of cotton, were brought on the second, and put into the garden of the consul's house on the 3rd of June. On the 4th, the state of the clothes was examined; they were foul with diseased matter, and of a detestable odour. A woman (infected with the plague) steeped them in mere water to remove the excess of dirt; after which they were passed into a vessel containing a solution made by M. D'Arcet, of 3 lbs. of the chlorides in 50 lbs. of water, and their they remained sixteen hours."

" On the 5th, in the morning, M. D'Arcet and Guilhau withdrew them from the solution; wrung them out and exposed them to the sun. The stains were weakened, but still very evident. At mid-day they were dry; each of us (M. M. Dumont, Guilhau, Lagasque, D'Arcet, Rose, and myself,) took two pieces of the clothing and put them on in contact with the skin. We put off this clothing on the 6th, after having worn it for 18 hours. No one suffered; since then, 22 days have passed, and our health is the same."

" The consequence of all this is, that we possess a means of i. disinfecting quickly and cheaply goods and clothing, without the least injury to them. ii. Of reducing the disease to its own case, and preventing it from producing a second or third case, as here, or a fourth or fifth case, as seen elsewhere; and that by destroying the venom left in the first case, which otherwise would perpetuate the evil; and not only can this be done with the plague, but with variola, rubeola, typhus, and even yellow-fever; for I shall die with the conviction that these fevers are contagious in Europe and every where."

" If this simple means be associated with better police regulations respecting interments in Egypt, and other parts of the Turkish empire, (for the sepulchres are here in a deplorable state), it is as clear as day that plague may be eradicated from the world."

" Since the 11th of June, we have seen and touched many patients, but no degree of plague has been contracted by us, the chloride having preserved us.

" Abdalla Pacha, who governs western Syria, writes to us thus—that the plague is at Acre, and begs for chloride. Many great Turkish personages at Tripoli have also requested them. Patience—good is done, but slowly, yet it is done: evil only is done quickly."

" Oh, that I could distinctly understand the judgment of the

Gibraltar junta on the character of the yellow fever!"—*Bull. Univ.*. c. xix. 233.

To these details a letter by M. D'Arcet adds other circumstances: he says, that when they wore the clothes next their skin they covered themselves up, and took much exercise to excite perspiration. At this time from 12 to 25 persons were dying per day. On the whole, the chloride of lime appears better than the soda preparation, because it attacks the fabrics less strongly. The chloride produced no effects when administered as medicine to those having the plague: they were neither better nor worse for it. Two hours after death, a corpse was opened and examined; it was first washed with chloride of lime and the hand kept continually bathed in the solution; the viscera was still warm. No injury to the examiners followed. *Revue. Ency*. xliv. 223.

Adhesion of Metals.—In the Bulletin Universelle, A xii, 440, it is stated, that M. Prechtt found the adhesion of two plates of the same metal to be the same, as the adhesion of one of those plates to a plate of another metal, having a less adhesive force to metal of its own nature. Thus if two plates of copper will adhere with a force of twenty-one grains, then one of these copper plates will adhere to a similar plate of bismuth, zinc, tin, or lead, with the same force, although two plates of any one of these metals will adhere with a less force.

This fact is at variance with the practice of our mechanics, who to prevent the adhering of the plugs of cocks, and of pistons, and plungers, usually make them of a differently constituted metal to that wherein they work.

On the Expansive Force of Freezing Water.—Experiments on the force exerted by water when it becomes solid, have been made in the arsenal at Warsaw, during the winters of 1828 and 1829. Howitzer shells were used for the purpose; they were of cast-iron, 6 inches eight lines in diameter, the aperture 1 inch 2 lines in diameter, and the thickness of metal 1 inch and 2 lines. One 46·29 cubical inches in capacity, was filled with water at 41° F., left open and exposed to the air at 21° F.: the frozen water formed a projecting cylinder of ice of the diameter of the aperture, which in two hours was 2 inches and 2 lines in length; this was the maximum effect, and shewed that the water, by freezing, had undergone an expansion of 2·31 cubic inches, or 1-20th of the whole volume. Another shell, after being filled with water, had the aperture closed by a wooden plug; it was then exposed to the same cold as before, the plug was driven out, and the ice occupied its place. Another shell, after being filled with water, was closed by an iron screw, perforated by a hole 3 lines in diameter, the temperature of the air was the same; after seven hours the shell was burst into two unequal parts, the larger being thrown a foot, and the smaller ten feet from the place; the ice had been formed to the thickness of 6 lines only, the rest

of the water remained fluid. Another shell was filled with water at 46° F., the aperture closed by a metallic screw, having a passage of six lines in diameter; it was exposed to the air at 28° F., the shell burst into two pieces, one of which was thrown 4 feet off, the thickness of the crust of ice was 13 lines, and the within remained liquid. Another shell was filled with water at the same temperature, closed by a solid screw, and exposed to the air at 28° F. as before; the shell was burst into two parts, the smaller being thrown about a foot from the place, and the thickness of the coating of ice within was 5 lines.—*Bull. Univ.* F. xiii, 314.—*Quar. Jour.*

New Medicinal Substance.—This substance has been obtained by M. M. Caventou and Francois, from the root of a Brazilian tree of the family of the rubiacies, called the cainça, (*chiococca recemosa,*) and in Bahia by the name of the *rairprela*, or black root. The peculiar chemical principle which gives character to the extract of this root has tonic without exciting properties. It slightly purges and is very diuretic. Its mode of action on the urinary passages is remarkable; the first day it very little augments the quantity of urine evacuated, but on continuing to adminster it, the effect is progressively increased from day to day. As the augmentation of action is slow, no undue irritation is produced; and in consequence, the administration of this body as a medicine has never produced more favourable effects than in those cases where the urine, red and irritating, has been rendered with much pain. The extract of the root being tonic, purgative and diuretic, it is evidently applicable in cases of dropsy, and and very favourable results have been obtained in several instances of this kind.—*Bull. Univ.* c. xix, 338.

Buccina! New Principle in Box-wood.—An apothecary of Bordeaux announced to the Pharmaceutical Society of Paris, at its last sitting, that he had discovered, in the wood, and particularly in the bark, of the box tree, an alkaline principle to which he gives the name of buccina. It is in the form of powder, and neutralizes acids, forming uncyrstallizable salts, it has a very strong sudorific action and bitter taste. M. Dupetit Thomas, in making this statement at the Philomathic Society, remarked that buccina might perhaps be advantageously used in the manufacture of beer, "for there is more box-wood than hops employed in making almost all the beer brewed in Paris."—*N. M. Mag.* xxx, 112.

Large Oak Trees.—When told of an oak, seven or ten feet diameter, it scarcely arrests our attention; but when we reflect that the smaller of these has a width of trunk as great as the carriage-way of Fetter Lane, near Temple Bar, or of Bedford Street, in the Strand, we become convinced of the surprising magnitude of such a living mass of time. The long oaken table in Dudley Castle, a single plank cut out of the trunk of an oak

growing in the neighbourhood, measured considerably longer than the bridge that crosses the lake in the Regent's Park. The famous roof of Westminster Hall, the span of which is among the greatest ever built without pillars, is little more than one third the width of the Worksop spread oak; its branches would reach over Wesminster Hall placed on either side of its trunk, and have near thirty-two feet to spare; the rafters of Westminister Hall roof, though without pillars have massive walls on each side to support them, but in the trees boughs of sixteen feet more extent are sustained at one end only. The Duke's walking-stick, in Welbeck Park, was higher than the roof of Westminster Abbey. The arch in the venerable Greendale oak, through which there is a road, and through which a carriage can be, and often has been driven, is higher than the entrance to Westminster Abbey (the Poets' Postern.) The ground plot of the Cowthorpe oak, now standing, is greater than that of the Eddystone Lighthouse. Upon Arthur's round table might be raised a church of equal capacity with the parish church of St. Lawrence, in the Isle of Wight; and if the basement of the Cowthorpe oak were substituted for the table, there would be plenty of room, not only to build the parochial church, but also to allow for a *small* cemetery beside. Indeed, with reference to the last named oak, and also some of those which the ancient Germans used as castles and forts, and in one of which a hermit had his cell and chapel, Mr. B. observed, that St. Bartholomew's, in the hamlet of Kingsland, between London and Hackney, which beside the ordinary furniture of a place of religious worship, viz. —desks for the minister and clerk, altar, staircase, stove, &c. has pews and seats for 120 persons, (upwards of 100 have been in it at the same time.) This chapel is nearly nine feet less in width, and only seventeen inches more in length than the ground plot of the Cowthorpe oak,—in fact, the tree occupies upwards of thirty square feet more than does the chapel.—*Burnett's Lecture.* —*Quar. Jour.*

LIST OF NEW PATENTS SEALED.

CALICO PRINTING.—To M. Bush, of Dalnonarch, Print Field, near Bonhill, by Dumbarton, North Britain, for certain improvements in machinery or apparatus for printing calicoes and other fabrics.—Dated 24th May, 1830. Specification to be enrolled in Six months.

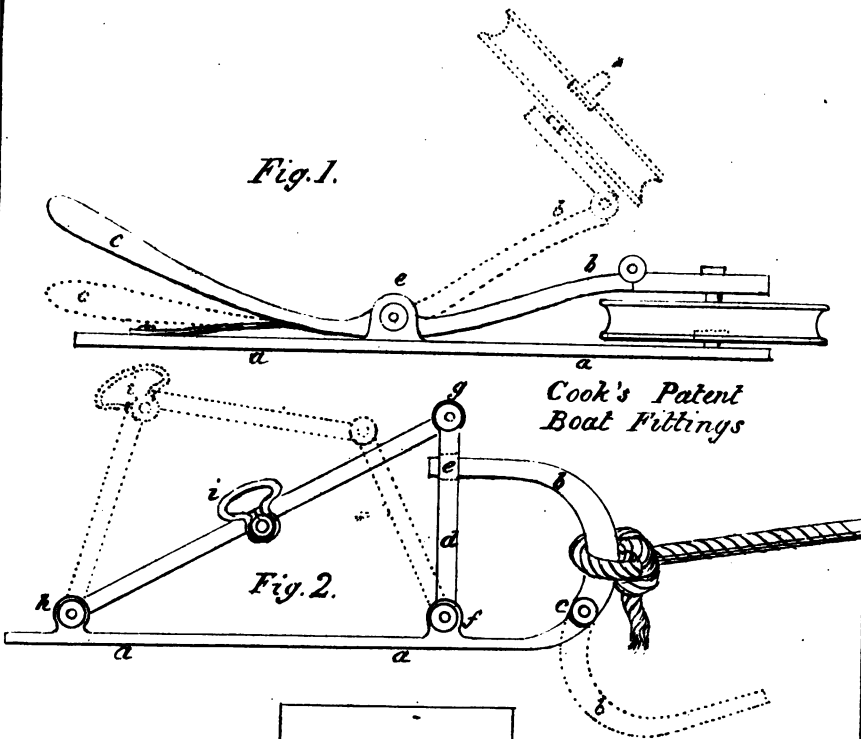
CORKS AND BUNGS.—To J. Holmes Bass, of Hatton Garden, London, for certain improvements in machinery for cutting corks and bungs.—3rd June, 1830. Six months.

LACE.—To J. Levers, of New Radford Works, near Nottingham, for certain improvements in machinery for making lace, commonly called bobbin net.—8th June, 1830.—Six months.

EXCAVATION OF EARTH.—To G. Vaughan Palmer, of Worcester, for a machine to cut and excavate earth.—June 8th, 1830. Six months.

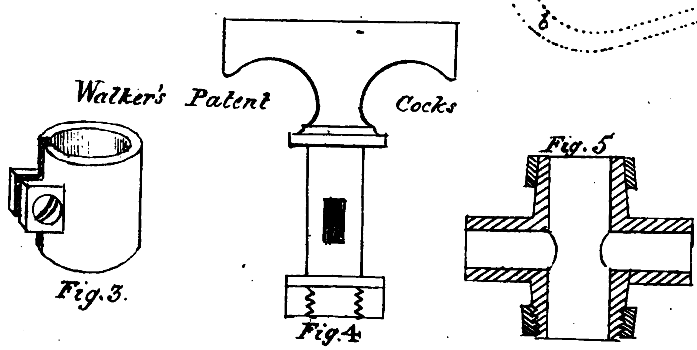
STEAM ENGINES.—To W. T. Haycraft, of Greenwich, for certain improvements in steam engines.—11th June, 1830. Six months.

MECHANICAL POWER.—To T. Brunton, of Commercial Road, Limehouse, and T. J. Fuller, of the same place, for an improved mechanical power applicable to machinery of different descriptions.—19th June, 1830. Six months.

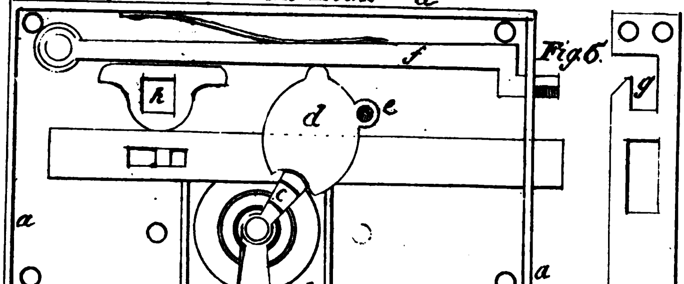


Cook's Patent Boat Fittings

Walker's Patent Cocks



Carpenter's Patent Locks



DESCRIPTIVE ACCOUNT OF ALL THE

PATENTS ENROLLED BETWEEN 20TH JUNE AND 20TH JULY 1830.

Particularizing the Offices in which the Specifications may be inspected with the Dates of Enrolment.

BOATS.—To Thomas Cook, of Blackheath Road, Lieutenant in the Royal Navy a patent for "certain improvements in the construction and fitting up of boats of various descriptions," was granted on the 24th of April, and the specification was deposited in the Enrolment Office on the 22nd of June, 1830.

No fewer than six improvements are contemplated by this patentee.

1. He proposes to render boats less liable to be sunk when accidentally filled with water, by the application of a kind of canvas deck; which is to be secured by a series of screws to a flanch, extending round the boat a little below the edge, and firmly fixed to its sides. A loose piece is placed above the fixed flanch; and between these, the edges of the canvas are secured by screwed bolts passing through holes, which are strengthened by working in the usual way. The wooden ledges or flanches between which the canvas is secured, are hollowed out as much as is consistent with the required strength, so that they may be rendered as light as possible. In various parts of this canvas deck are introduced holes with bags attached, extending to the bottom of the boat for the feet of the crew and passengers; and in large boats, some of these bags are made to admit a person entirely below the surface of the deck.

2. A plan for permitting the escape of the water which may get into the boat on the canvas deck, is described to consist of a set of circular holes with screwed stoppers precisely similar to those deck-lights and ventilators recently introduced into the decks of smacks and other vessels. The only difference is, that the stoppers, instead of being made of glass for the admission of light, or trellis work for the passage of air, are made solid. This plan we consider to be very inferior to Mr. Dodgson's patent scuppers, described at page 11 of our present volume.

3. To prevent the boat from being damaged from contact with vessels, piers, or other perpendicular objects, Lieutenant Cook proposes a fender, consisting of a roll of cork cuttings inclosed in a canvas bag, extending along each side of the boat, and joined at the stem and stern; or he makes the canvas

bags air tight and fills them with air, and in either case these fenders will not only protect the boat from injury arising from collision with other bodies, but they will render it much more buoyant, and consequently of great importance as a life boat.

4. An arrangement by which the ballast may be instantly discharged in case of necessity is next described. It consists of bars of iron supported on bolts passing through the keel : each bolt having four nuts screwed upon it. Two of the nuts screw against the sides of the keel, by which the bolt is fixed firmly in its place. And between these nuts and the others which are screwed on the ends of the bolts are placed the ballast bars, which are slit at their ends to receive the bolts, and so attached, that a person within the boat can release the bars from the bolts and thus lighten the boat in cases of danger.

5. Lieutenant Cook's fifth improvement consists, in a slip pulley, by which the boat's sail can be instantly let go when squally weather renders such a precaution necessary. This pulley is represented by fig. 1, Pl. V. where *a a* shows that part of the pulley frame by which it is screwed to the side of the boat or any other fixed object : *b*, the upper part of the frame, which can be elevated by depressing the handle *c*, when the axis of the pulley will be released from the lower plate, and the upper frame permitted to fold back at the joint *e*, and assume the position represented by the dotted lines, by which the rope passing through it will be instantly liberated.

6. His sixth contrivance consists of a hook which can be instantly disengaged, applicable to the lowering of ship's boats and disengaging them from ships in distress while the sea is rough, and in other cases, where an instantaneous detachment becomes of importance. This hook is represented by fig. 2, Pl. V. where *a a* represents a plate by which the hook is to be attached to a pulley, block, or any fixed object: *b*, is the hook with a joint at *c*; an upright piece *d*, keeps the hook secure by its end passing through a hole at *e* ; this upright piece is jointed to the bottom plate at *f*, and to the inclined bar at *g*. *h* is likewise jointed to both ends as well as in the middle, where it is furnished with a handle *i*, which being pulled up draws over the piece *d*, and permits the end of the hook to escape from the hole at *e*, when the hook will fold back and liberate whatever may be attached to it.

There are numerous instances connected with naval affairs, in which this, as well as the last-mentioned contrivance, will prove of considerable importance : and, although the rest of the pa-

tentee's improvements are not by any means without merit, we consider the last two by far the most useful and general in their application.

STOP COCKS.—To John Walker, of Weymouth Street, London, Esq. a patent for "an improved cock for fluids," was granted on the 4th of May, and the specification was lodged in the Enrolment Office on the 2nd of July, 1830.

The improvement here contemplated is the substitution, for the usual conical plug of a stop cock, one of a cylindrical form fitting into a cylindrical cavity with top and bottom flanches, either ground to fit air-tight, or furnished with washers of some soft material to constitute an air-tight fitting; the lower flanch is kept in its place by a nut which screws upon the end of the plug, instead of into its end, as is the usual practice in the finer kind of stop cocks. To compensate for the wear of the cock, by which the cylinder would become too wide for the plug, Mr. Walker proposes to make a longitudinal cut through one side of the cylinder, and to tighten it with a tangent binding screw, as represented by fig. 3, Pl. V. by a tapering screw and nut, represented at *a*, fig. 4, or else by a hoop forced on a conical portion of the ends of the cylinder, as represented by *b* in the same figure. Fig. 5 shows the cylindrical plug mentioned, with its flanges and binding nut, which is to be secured in its place by a small screw.

It is to be regretted that the inventor did not make himself acquainted with the essentials required in a stop cock, before he put himself to the expense of this patent.

PROPELLING VESSELS.—To William Hale, of Colchester, Essex, Machinist, a patent for "a machine or method of raising or forcing water for propelling vessels," was granted on the 12th of January, and the specification was lodged in the Enrolment Office on the 12th of July, 1830.

Mr. Hale proposes to employ a paddle box entirely filled with water, and made air tight, except at the centre, where they are one or more apertures for the admission of water, and at the circumference, where there are one or more openings for its escape. The centrifugal force of the paddles acting on the water within the box, produces a pressure all round the interior of the box, which gives a tendency to move in a direction opposite to the side where the opening is made in the circumference; while the same

cause accelerates the entrance of the water into the box, which is produced in the first instance by the paddle box being placed within the vessel, and lower than the exterior water.

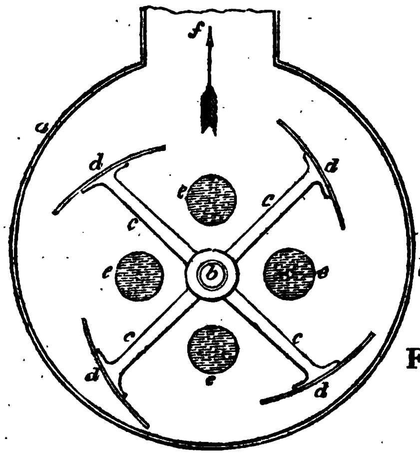


Fig. 1.

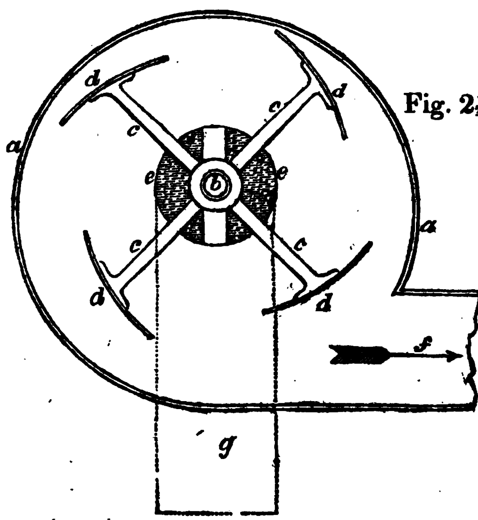


Fig. 2.

Fig. 1 represents one modification of the apparatus, and consists of an air-tight circular casing *a a*, containing four arms *c c c c*, which revolve horizontally on a vertical axis *b*, placed eccentrically with respeet to the casing: at the extremities of the

arms are fixed four curved vanes or paddles *d d d d*, inclined in the manner represented in the drawing. The water enters the casing through the holes *e e e e*, and is expelled by the revolution of the paddles through the opening *f*, against the external water at the stern, which of course impels the vessel in the contrary direction.

Fig. 2 is another modification of the apparatus. In this similar letters of reference indicate similar parts, with only these differences in the arrangement, that the water is received at one large aperture in the centre of the vanes, the line of direction of the discharge being a tangent to the circle. The dotted lines at *g* denote a tube leading from the bottom of the vessel, through which the water ascends into the paddle box; and it may be supposed, that similar tubes are employed in the first described plan, for conducting the water into the paddle box.

Another modification is represented in the specification, in which the water is expelled through two apertures, instead of one, and it is stated, that the paddles may be either placed vertically or horizontally, according to the form of the space which they are designed to occupy in the vessel.

It is difficult to discover the advantages which the patentee expects to gain by these contrivances; we fear, that the power required to produce, in a large body of water, such as the contents of one of his paddle boxes, a rotatory motion of sufficient velocity to produce an available centrifugal force, would be too great to render the plan desirable in point of economy.

Locks.—To James Carpenter, of Willinhall, in the parish of Wolverhampton, Staffordshire, and John Young, of the same place, Locksmiths, a patent for "certain improvements on locks and other securities, applicable to doors and other purposes," was granted on the 18th of January, and the specification was deposited in the Enrolment Office on the 17th of July, 1830.

The intention of these patentees appears to be, to produce locks of greater security and stability than the common locks, without augmenting the cost; and also, to construct a latch lock, somewhat more convenient in use. The greater degree of security they propose to obtain, by having a double set of tumblers, one set attached to, and moveable with, the bolt, and the other attached to the plate of the lock, in the usual way. Projections from the stationary tumblers fit into slits in the moveable ones, when they are simultaneously elevated to a given position: and,

in addition to this, there are notches cut in the upper and lower sides of the moveable tumblers to fit fixed pins projecting from the plate just above the notches on the upper side, and just below those of the under side, when the door is locked, so that the bolt cannot be withdrawn, except by a key, which raises each tumbler to an elevation, coinciding precisely with the cuts in the original key, and upon this depends the security.

It is proposed to introduce instead of the usual spring latch, one which shuts by dropping into a notch in the striking plate, after it has been elevated by passing over an inclined plane. In connection with this latch is a tumbler, by which it is elevated through the instrumentality of a key, by a handle on one side of the door and the key on the other, or by the key, without using the handle. These improvements will, however, be better understood on inspecting fig. 6, Pl. V. where *a a* represents the rim of the lock, with the inside plate removed. *b* is the bridge of wards. *c* the bit of the key in the key hole, acting upon a tumbler *d* moving upon an axis *e*, and in the act of raising the latch *f*, so that it may pass out of the cavity *g* in the box or striking plate. *h* is the brass follower, into which fits the square spindle of the handle by which the latch is raised on one side of the door, without the key.

This lock may be provided with the various securities above described, and made of the mortice or any other form, according to the purposes for which it is intended.

Brick Machinery.—To Henry Robert Salmon Devenoge, of Little Stanhope Street, May Fair, London, a patent for "certain improvement of machinery for making bricks," was granted on the 8th of May, and the specification was lodged in the Enrolment Office on the 7th of July, 1830.

When precisely the same operation is required to be continually repeated in any manufacture, machinery is generally found to be an advantageous substitute for manual labour, and in few instances would this seem to be more applicable than in the making of bricks; if we may judge, however, from the little success which has attended the numerous attempts at making bricks by machinery, we must conclude, either that the operation is one requiring the exercise of judgment during the process, or else that the gentlemen who have invented brick machines, and secured monopolies in their construction at a great expense, must have been unacquainted with the real nature of the process for which their

machines were intended: and from an attentive consideration of the subject, and a reference to the description of persons who have hitherto become patentees of inventions of this kind, the probability is much in favour of the latter conclusion.* Nor is the invention before us, which is said to be the communication of a foreigner, much calculated to alter our opinion on this subject.

Mr. Devenoge's machine is similar in principle, as far as regards the position and motion of the brick moulds, to that patented in 1824, by Mr. William Leahy, who proposed to force the prepared materials by means of a plunger into a series of rectangular compartments formed as moulds in the periphery of a rotatory cylinder or drum. But instead of using one cylinder, the present patentee, to force the clay into the moulds, employs two cylinders revolving with their peripheries in contact, and so adjusted, that the blank parts of one cylinder comes opposite to the moulds in the other, and thus force the clay into them, and at the same time hollows the surface of the clay to form the requisite bed for the mortar. The reverse side of the brick is also formed hollow by a protuberance at the bottom of the moulds. The upper sides of the cylinders are charged with the prepared material from hoppers placed over them, and the material being pressed into the moulds by the cylinders revolving in contact, as above described, the bricks are delivered by the shifting of the mould bottoms when they descend to the lower part; where they are deposited upon an endless chain made of cross planks joined together, supported upon a series of anti-friction rollers, and put in motion by two drums about which the chain returns. By this means the bricks are taken from the machine and they are then conveyed to the drying ground in the usual way.

The patentee states that his plan of liberating the bricks from the mould renders sand unnecessary; but least it should be preferred, he has provided a sieve apparatus by which it can be distributed over the moulds before they are charged with the clay. There are several arrangements connected with this invention

* A somewhat curious instance in confirmation of this opinion occurred in 1825, when a patentee of a brick machine instead of sanding each mould or portion of clay entering it, to prevent the clay from sticking to the mould and other parts of the apparatus, directs "that the portion of it that is put into the feeding hopper should be previously covered on all sides with as much sand as will adhere to it." Probably he was actuated by reasons similar to those which induced Dr. Franklin to advise his father to save time, by saying grace over the whole carcase of a dead pig at once, instead of each portion as it was brought to the table.

deserving of commendation. The method of pressing the clay into the mould is ingenious, and the circumstance of the descending sides of the cylinders being continually loaded, is a point of much importance, as it will diminish considerably the force required to keep the apparatus in motion.

DISPUTED CLAIM OF PATENT-RIGHT,

Between Messrs. Cochrane and Galloway, Plaintiffs, and Messrs. Braithwaite and Ericcson, Defendants, respecting a *Steam Engine* Boiler.

The controversy between the above mentioned parties having excited a great deal of attention in the minds of the mechanical part of the public, we have been told that it will be "as much as our place is worth" if we omit to give a full, true, and particular account of the matter; and as we value dearly the dignified post of Editor, we are reluctantly compelled, in obedience to the mandate, to talk over the old worn-out story of the pot and the kettle calling each other ugly names; for in no other light, can we view this question of patent-right. It is however some consolation to us, that we shall be able to throw a little light upon the subject, and show that Mr. Galloway's pot, and Mr. Braithwaite's kettle (including his "*furnace flue*") are equally *black*, and nearly as antiquated as their quarrelsome predecessors that figure in the fable.

The most direct way of proceeding in this business, appears to be, *to go backwards*, and trace the stream of invention from the present *stagnant pool* to its source.—To go forwards, we are told is impossible, since the stream can flow no further: it having been sworn in several affidavits on the part of Messrs. Braithwaite and Ericcson, that by no other means of generating steam can such extraordinary results be effected. Let not however our ingenious readers be discouraged by such declarations from boiler makers. The bright sun of genius has not set for ever, but will continue to foster and reward their exertions, in spite of the nonsense contained in the affidavits alluded to.

In our last volume we gave a short account of the boiler of the "Novelty" Steam Carriage, wherein we observed page 109, that it "did not appear to us to possess, in its essential parts, much of that character which its name indicated," and while we retain this opinion, we feel a desire to do the proprietors the justice of observing, that great credit is due to them for the masterly manner in which they complete their work, and for the good sense and discrimination with which they select from the inventions of other men, the means of making their carriages run well; we allude in particular, to their adoption of the beautiful metallic

pistons of Barton and the admirable wheels of Theodore Jones. It is to this mode of proceeding joined to their own excellent workmanship, and their determination to make steam in their boilers, coute qui coute, that they were enabled to produce such an unusual velocity of motion on the Manchester and Liverpool Railway.

When we described their machinery, we knew perfectly well their claims to patent-right rested upon very slender grounds, and could have referred to previous inventions of the same kind, but were unwilling to do so lest our motives should have been misconstrued. In the specification of the patent, the words of the claims are as follows:—*We claim as our invention, the converting of liquids into vapour or steam, by means of a boiler, wherein the capacity of the flue is too small to allow a sufficient quantity of heated air to pass through it in a given time, by the mere agency of what is called atmospheric draught, and to which, therefore, either an air-exhausting apparatus, or the air-forcing apparatus hereinbefore described is applied for that purpose; it being our intention to claim* AS NEW *the application of an air-exhausting apparatus generally for such purpose, and the particular air-forcing apparatus hereinbefore described, whereby, as well as in the air-exhausting apparatus, the fuel is supplied with air both above and below, as shown in the drawing (annexed); which double supply of air regulated by cocks as aforesaid, we claim also as new.*"

With respect to the first mentioned claim, that of using very small tortuous flues, and forcing a current of air through them, we recollect several instances of the kind. Spiral worms similar to distiller's refrigeratories have been used for this purpose, one of which, described in the Register of Arts, (first series) third volume, is the invention of Mr. Suwerkropp. The capacity, length, and other proportions of such flues, have a close resemblance to Messrs. Braithwaite and Erricson's. And with regard to the second condition attached to this claim, that of the flues being "too small to allow a sufficient quantity of heated air to pass through it in a given time, by the mere agency of what is called atmospheric draught, and to which, therefore, *either* an air-exhausting apparatus, or the air-forcing apparatus hereinbefore described is applied for that purpose:"—we have only to observe, that Mr. Neville, the Engineer, of Shad Thames, took out a patent March 14, 1826, for an apparatus in which the tubes used as flues are even of smaller calibre than Messrs. Braithwaite and Erricson's, and Mr. Neville made use of a blowing machine to force a current of air through them.

In Mr. Neville's specification is represented a close cylindrical furnace and boiler posited vertically, but he distinctly states that this position may be varied; and he claims generally, all modifications of his apparatus, wherein the heated vapours and gases from the fuel are made to circulate through a series of small tubes surrounded

by water. Here is therefore, the arrangement and application, claimed as new by Messrs. Braithwaite and Erricson three years afterwards.

Messrs. Braithwaite and Erricson's second claim, is "the application of an air-exhausting apparatus generally for such purpose." The earliest invention that occurs to us of this kind is 38 years old, and is the patent of Mr. Charles Ward, of Hatton Garden, being dated March 17, 1792. The specification of Mr. Ward's patent is given in the first vol. of the Repertory of Arts, from which we make the following extract (page 374):—

"My invention supplies this defect" (the defect of the non-consumption of smoke and waste of fuel) "by making a constant draught of air necessary for the burning of the fires, and causing the vapour to pass through, or be retained in proper vessels a sufficient time for it to condense; this is effected by connecting the aperture of the chimney or chimneys, with the condensing vessels or chambers, by means of tubes or pipes; then is to be placed, either between this connection, or behind the condensing vessels, any machine or machinery, whose principle depends upon the known property of all fluids rushing in to fill up the vacuum caused by their action, that is to say:—air-pumps, water pumps, ventilators, bellows, air machines, &c. these, however different their constructions, have all one common principle, and therefore the application of them, or others depending upon the said principle, to effect the purpose above mentioned, will be an infringement upon my said patent."

It was not proposed as an appendage to the steam engine, but simply to a furnace for condensing the products arising from the combustion of fuel. This arrangement has been public property for 24 years, and we conceive that as no *particular* furnace is specified to which it is applicable, that the public have a right to apply it to *any* furnace, and consequently to a steam engine furnace; were it for this reason only, we think Messrs. Braithwaite and Erricson's claim would be invalid. But there are other reasons on which no doubt can be entertained. We have individually seen several kinds of air-exhausting apparatuses actually in operation in drawing the air through the furnaces of steam engines, long before the date of the patent in question.

The *third claim* of Messrs. Braithwaite and Erricson is "for the particular air-forcing apparatus described." Were this invention perfectly new, and had a distinct patent been taken out for it, an exclusive privilege might be sustained, but owing to its being included in the existing patent, which claims other things that are not new, it falls to the ground.*

We have seen many air pumps or blowing machines that have considerable similarity to this "particular" apparatus; but there

* This circumstance is a sad defect in our patent laws. which there is reason to hope will 'ere long be remedied.

is perhaps something new in the arrangement of the parts, which ought however to have been very distinctly described in the specification, and the novelty pointed out. It was at any rate injudicious to introduce such a claim in a specification, if good in other respects, because the apparatus in question is perfectly needless, there being various other blowing machines that perform with equal energy and uniformity; so as to afford no inducement to copy the peculiar modification of Messrs. Braithwaite and Erricson.

The fourth claim, is for forcing air "both above and below" the fire at the same time, which double supply of air, regulated by cocks, they claim as new. We question much the soundness of this claim. It is usual to supply furnaces by forcing the air under the grate bars, and sometimes, with the view of consuming the smoke, to force in another current above, to drive the ascending vapours formed in the fore part of the fire against the more intensely heated portion of the fuel behind.

We are at loss to conceive how it could have entered into the imagination of the patentees to restrict other people from breathing two ways at once without their leave. The operation both in nature and art, is "as old as the hills." It has been admitted from time immemorial, that provided the two currents be both hot, or both cold, it is legal and moral to do so without a patent. This is distinctly proved by that excellent lawyer Æsop, who quotes the case of an individual being engaged in blowing both hot and cold at the same time—got himself turned out of doors—and the act was deemed a justifiable one. The patentees' method of blowing, is however both cold, according to the practice of good old times.

Having now shown, in our own estimation, that "The Novelty," "does not possess much of that character which its name indicates," we proceed to the consideration of the apparatus patented by Lord Cochrane and Mr. Alexander Galloway, who say, that this invention of theirs has been pirated by Messrs. Braithwaite and Erricson. In the first place, we lay before our readers such extracts from the specification of Messrs. Cochrane and Galloway, as recites their particular claims, and is descriptive of an apparatus in exemplification of those claims.

"Now know ye, that in compliance with the said proviso, I, the said Alexander Galloway, do hereby declare, that the nature of our said invention, and the manner in which the same is to be performed, are particularly described and ascertained in manner following, (that is to say):—

"Our invention consists of making and forming a machine or machines for the heating of boilers, and may be denominated improved air-tight stoves, furnaces, or fire-places, into which cold, or rather, combustible and inflammable substances shall be used to generate and convey heat by the ignition and combustion of

coal or other fit substances; and which air-tight stoves, furnaces, or fire-places, must be composed and formed of any suitable materials, and with means which will permit the entrance and prevent the escape of any atmospheric air or gas into or from such stove, furnace, or fire-place; but at the situation or situations formed for the introduction and exit of such air or gas by means of pumps, valves, or other suitable machinery, which shall be capable of supplying any such stoves, furnaces, or fire-places, with any required quantity of atmospheric air to keep up the ignition of any fuel or combustible substance, and, at the same time, to force out of any such stove, furnace, or fire-place, any smoke or gas so generated against any required resistance or pressure. Our invent'on is of a threefold character—the first part of it is for removing the inconvenience of smoke or gases generated in stoves, furnaces, or fire-places, by the ignition or combustion of coals or other inflammable substances; the second part is, in certain cases, for directing the heat so generated; and the third part is for applying such smoke or gas to various useful purposes, as hereafter to be explained. These said branches or parts of our invention may be applied collectively, or so much of them as may be required, under a great variety of modifications, which will be familiar to any competent workman constructing such works.

Figs. 1 and 2*. are views of machines for forming air-tight stoves, furnaces, or fire-places, for heating boilers for generating steam, with the apparatus for blowing in compressed air into the fire-place, and for condensing and dissipating, and thereby removing the inconvenience and annoyance of smoke and gases generated in any air-tight stove, furnace, or fire-place, but without applying such smoke or gas to any useful object, and which are applicable to any land situation, but of such dimensions and modifications as may best suit the particular convenience of the employment and place to which they are to be applied.

"A A A A show an air-tight horizontal and vertical stove, furnace, or fire-place, with its flues to heat a boiler for generating steam, or for such other purposes to which it may be found convenient to apply the action of heat. B is is the pipe through which a supply of atmospheric air is conveyed by means of a pump or pumps, or other instrument for forcing air into the fire-place to to keep up the combustion of any fuel previously ignited. In the pipe B is contained a metal valve, which shuts against its seat by the pressure of the smoke from the fire and opens by the force of the atmospheric air conveyed from the pump or other proper instrument, employed to blow in the air; the pipe B may either discharge its supplies of air by being introduced under or upon the ignited fuel of the horizontal fire, or be conveyed into any convenient part of the vertical fire-place; or if more than one pump is employed for this purpose, then the air may be blown into both

* Fig 2 we have not found it necessary to give.

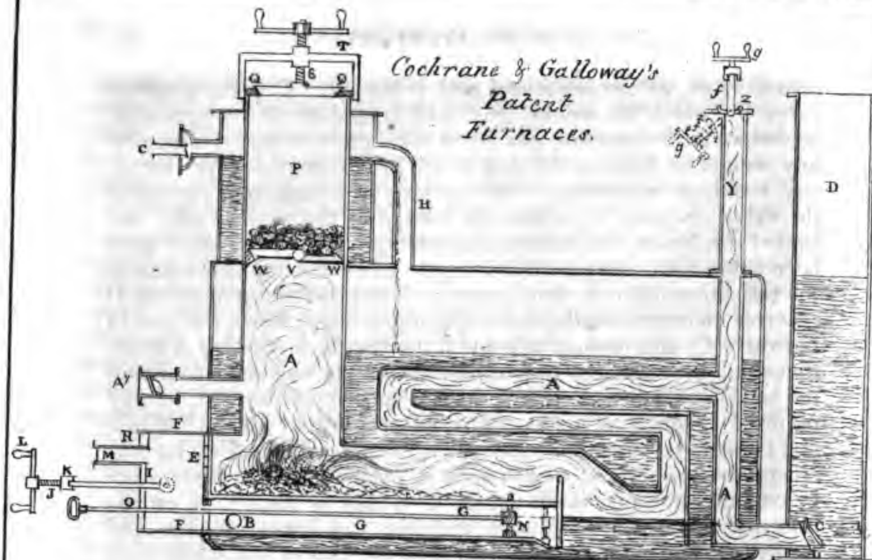


Fig 1

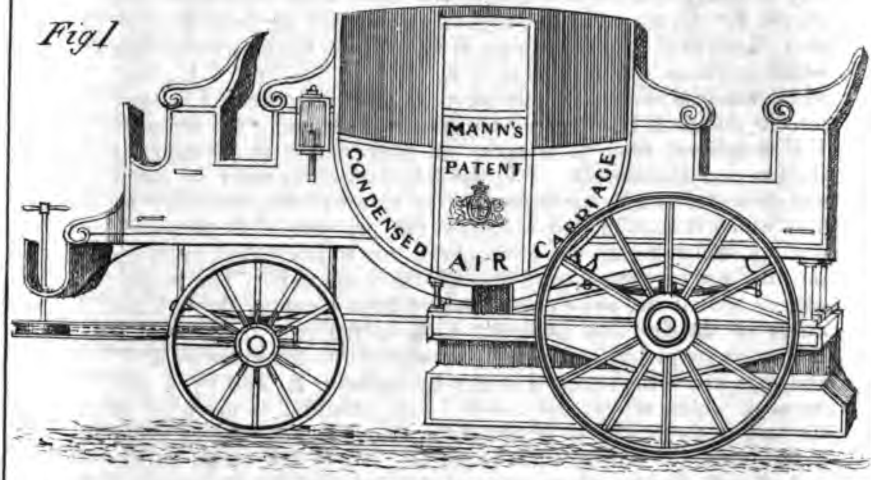


Fig. 2

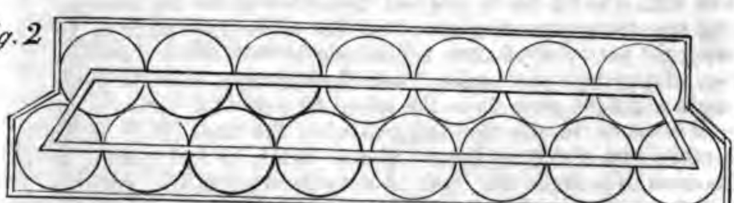
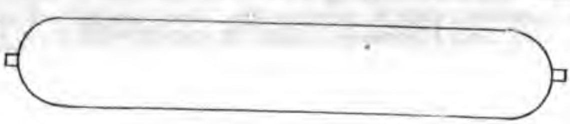


Fig. 3.



fires at once, as circumstances may point out. C is the plate or valve by which the smoke, gas, and heated air are compressed, according to the pressure placed on such plate or valve, either by any weight or fluid, or by any other known means of producing any required resistance. The opening or rising from its seat of the valve or plate C, allows the escape of the smoke, gas, and heated air, ween the infiammable parts of the smoke shall have been subjected to any required degree of exhaustion according to the resistance made to their escape. The reservoir or vessel D D receives and encloses the end of the pipe, which forms the seat of the valve C, and is made to contain the required quantity of water that shall be sufficient to perform the double object of confining the smoke until it is deprived, by the action of the fire, of any required quantity of its combustible properties; and in its exit and passage through the water, it is cleansed of somé of its mucilaginous properties, and in such a purified state it may either be collected for any useful object, or it may be allowed to escape into the atmosphere without creating the inconvenience and annoyance generally experienced from the exit of foul smoke from any ordinary chimney; particularly from those chimneys employed for the use of steam-engines. E E are the iron doors to shut off the fire; and the ash-pit G G. F F is the metal chamber which encloses the fire-doors E E, and the ash-pit G G, and which must be made perfectly air-tight when its cover I I is shut into its mouth H H. This mouth or curved orifice in the chamber F F furnishes, when it is open, an introduction to the doors of the fire and the ash-pit. I I, the spherical cover must be fitted and ground correctly air-tight into the mouth of the chamber F F, and which is kept in that state by the pressure of the screw J, and by which means the atmospheric air is prevented entering into the fire or the ash-pit, through the doors E E. The smoke, gas, or heated air, are equally secured from escaping through the doors of the fire and ash-pit. K K is the iron bridge which swings on its pivots, and which is connected to the chamber F F, and into which the screw J works by its lever L, and by a few turns of which screw, the cover I I is admitted to move out of the way of the oriffce or mouth of the chamber, and thereby gives a free entrance into it when required. M M are metal tubes, and of sufficient length to prevent the action of the fire from injuring the strong glass or glasses that are to be fixed in them for viewing the fire, and of such a diameter as will afford a general survey of the fire; these tubes, with their glasses, must be made air-tight and fixed securely in the spherical cover I I, opposite the apertures made in the fire-doors to view the fire. N N is an iron rake, with a shifting handle and a roller, or feet placed at the bottom to prevent the teeth of the rake from falling entirely out of the fire bars, although it is desirable that they should be as low as possible; and it is necessary when this rake is not in use that it should be kept in the recess, made for it in the ash-pit

at *d*, and which is introduced into the ash-pit for distributing the fire and for clearing the bars on which the fire is placed, and which rake moves in a ball and socket stuffing-box O, inserted in the cover I I; by this means the fire is raked without opening the cover I I, and without sustaining any loss of the compressed air with which the fire and ash-pit is supplied. P P is a metallic magazine, placed at the top of the vertical fire, and surrounded with a case or reservoir for holding of water to keep the reservoir from becoming too warm, and from which the boiler may be supplied with warm water as fast as the reservoir is fed with cold water; and which magazine P P may be made to contain any required supply of unignited fuel, and which magazine must be made air-tight in all its parts. Q is the frame or mouth of the magazine through which the fuel is to be conveyed into the interio of it. R is the air-tight cover or plate, which by the pressure of the screw S working through the swinging-bridge T, forces down the cover R. Near the bottom of the magazine P P is placed a valve or door V, with an axle through or across its centre, after the manner of a throttle-valve of a steam-engine as respects the axle of the valve or door; one-half of which valve or door will rest when closed on the lower part of the seat W W, while the other half of the valve or door rests on the upper part of the seat. The form of the valve-seat, as shown at W W, will be found to be very convenient, as by its angular shape no coals or other fuel will lay upon it to obstruct the shutting of the valve or door V. The object of this valve or door is not only to shut off the unignited fuel from the vertical fire, but to allow the magazine P P to be replenished with fuel as often as required, without permitting any considerable escape of smoke, gas, or heated air; and when the cover R is closed or shut, then the valve V may be opened whenever the fire shall require any additional supply of fuel; and when it so opened, the cover R must completely prevent the escape of any smoke, gas, or heated air, through the magazine P P. Y is a chimney, of any required height, issuing from the top of the boiler, and in connexion with the flue with its cover Z Z, its screw *e*, the bridge *f*, in which the screw works, and the lever *g*, by which it is moved. This chimney may be used for carrying off the smoke when the fire is first lighted, and when the valve or cover I I is opened to admit freely and copiously the atmospheric air under the fire when the stove, furnace, or fire-place of the boiler is so used, then it is a fire on the common principle, and when used in that state it forms no part of our invention; but when the covers and valves I I and Z Z, with either the cover R or the valve V, are shut by any sufficient machinery, and rendered air-tight in those parts, and a full supply of atmospheric air is forced into the fire at the place or places assigned for its entrance, then such a change and combination in the machinery puts this part of the principle of our invention in full force. A fire-place and its apparatus thus arranged will produce not only a saving of

fuel by extracting a greater quantity of combustible material from the fuel, but will direct the heat to the object of its application more effectually than hitherto done, and will, at the same time, remove the inconvenience and annoyance sustained from the issue of large quantities of foul smoke, as at present experienced from ordinary fires and chimneys employed for the heating of boilers."

The preceding forms only a part of the specification of the plantiffs; in our next we shall probably give the remainder, with some remarks upon its practical application and utility.

From the concluding portion of the matter which we have quoted, it is evident that the plantiffs *disclaim* any patent in the arrangement of the boiler and flues, when the valves and covers described at the extremities are not used; the words being "when used in that state, *it forms no part of our invention*," and as the defendants do not employ any of those appendages which the plaintiffs claim as their invention, we cannot conceive on what ground any restriction ought to be imposed upon the defendants continuing to manufacture their boilers.

The actual *claim* made by the plaintiffs may be said to consist in an air-tight furnace, and the application of a valve to afford a sensible resistance to the passage of the air and products of combustion.

With respect to the first of these, there may be some novelty, in having the several parts, where access is had to the fire, *ground* together so as to exclude as much as possible the passage of air between them, and it is a novelty which no person will we are persuaded attempt to follow them in,—but it is no uncommon thing for furnaces to be so fitted, as to be what is called *close*, in order that the current of air forced in may not take a wrong direction. This is indeed a matter of necessity, and has been in practice before either the plaintiffs or defendants were born.

With respect to the other claim, the application of a valve to arrest the progress of the heated air, &c. we have evidence before us that it is at least thirty-two years old, a patent having been granted to Mr. Thomas Rountree, of Great Surrey Street, Blackfriars, on the 1st of May, 1798, "for his invention of a new method of applying fire for the purpose of heating boilers and other vessels where heat is required, and which also may be applied to other purposes." This patentee was an ignorant man himself, and probably employed (as is the custom at the present day) as ignorant a man to prepare his specification. The consequence was, his patent was set aside by Lord Eldon on the ground that the specification was not sufficiently clear, to enable an ordinary person in the line of business to which it relates, to construct an apparatus like that which the patentee proposed; but the real nature and principle of the arrangement was explained by the evidence brought forward by the patentee to support his monopoly. From this evidence we will make only a single extract, which is sufficient to satisfy the most sceptical.

Mr. Hindmarsh stated, "that it further consisted in the elevated situation and smallness of the aperture leading from the furnace towards the chimney; whereby the flame and hot air are impeded in their progress to the atmosphere, and compelled to tarry in the cavity of the furnace, and occupy every part thereof much longer than they otherwise would do. This effect in stopping, checking, and as it were arresting the flame and hot air in their attempt to escape into the atmosphere, Mr. Hindmarsh considered as not only new,, but singularly beneficial; for by this means the flame and hot air are detained in the very place where their presence is most wanted, and constrained to give forth their energies with an *impetus* against the bottoms and sides of the vessel to be heated; whereas, in none of the furnaces heretofore erected, was any effectual stop interposed between the fire and the chimney, to cause the flame and hot air to dwell under and round the sides of the vessel; but they passed rapidly off into the atmosphere, either by a direct communication through the chimney, or indirectly, but almost as speedily, by flues."

Having thus disposed of the claims to invention set up by both plaintiffs and defendant, we proceed to make a few comments on the proceedings before the Chancellor on the subject.

We have frequently had occasion to regret the manner in which scientific professional opinions on litigated mechanical questions have been *got up*, (we use this homely phrase advisedly, for no other would so well express our meaning,) but in no case have the absurdity, inutility, and we may add injustice of the practice, been so completely exhibited to the public, as in the present case; wherein we see one set of men, *of undoubted talent and integrity*, swear possitively, that certain allegations are true, which are just as positively sworn to be false by another set of men, *of equal talent and equal integrity*. Lest, however, we should be supposed to make unfounded statements, we have subjoined a few extracts from the affidavits alluded to, and in order that the allegations of the different partizans may be more easily contrasted, we have placed them in opposite columns.

Is this true?

EDWARD TURILL, the mechanical Engraver, swears,—That a comparison of the specification shows the substantial identity of both as follows:—

1. The *co-plaintiffs* claim as new an air-tight furnace as part of their apparatus for generating steam.

2. The *defendants* use an air-tight furnace as part of their apparatus for generating steam.

3. The *plaintiffs* support the combustion of fuel in their furnace, by forcing atmospheric air into the fur-

Or is this true?

THOMAS WEEDON, of Loud Water-mills, Hertfordshire, Paper Manufacturer, swears,

That he did not observe any similarity between the two, excepting only that both used a bellows and fed from a hopper which he believes to be old, and is not claimed by the plaintiffs as part of their inventions.

That he does not consider the inventions alike either in principle or detail.

That the hopper from which the plaintiffs fed their fire was not agree-

nace by means of a blowing or air-forcing pump.

4. The *defendants* support the combustion of fuel in their furnace by atmospheric air forced into the furnace by means of a blowing or air-forcing pump.

5 The *plaintiffs* introduce air from their blowing pump through a pipe under the fuel; but describe it to be their intention to let it enter at any convenient part or parts of the furnace, that is to say, either under or above the ignited fuel.

6. The *defendants* introduce air from their blowing or air-forcing pump through two pipes, one of which supplies air under the fire and the other above.

7. The *plaintiffs* supply fuel to their fire from a vertical air-tight magazine, which might with equal propriety be called a hopper.

8. The *defendants* supply fuel to their fire from a vertical air-tight hopper, which might with equal propriety be called a magazine.

9. The *plaintiffs* support their supply of fuel upon the surface of a moveable *plate* or valve, which *plate* or valve is capable of being moved, and thereby delivering a supply to the fire by a *rod* or handle on the outside of the magazine or hopper.

10. The *defendants* support their supply of fuel upon the surface of a moveable plate or valve, which plate or valve is capable of being moved, and thereby delivering a supply to the fire by a rod or handle on the outside of the hopper or magazine.

And this deponent further saith, that the patent obtained by the defendants has the title as follows:—A new invented mode or method of converting liquids into vapour or steam, and that upon comparing this title with a part of the patent, it may easily be discovered that both *aim* at producing an economical mode of heating boilers for the generating of steam, and if this fact be kept steadily in view, the identity of the means employed will appear more evident; and this deponent further saith, that it is his opinion from the perfect identity of *principle* adapted to produce the same effect, namely, that of generating steam, and also the complete identity both in the nature and use of the several parts, and also in their able to the drawing in their specification, but like the one used by the defendants, and which is not claimed in the specification of either.

And that the defendants has not infringed in any particular of the plaintiffs' patent.

combinations, that the sections or divisions of the several machines herein examined and compared are the same, and consequently that the patent of the said defendants is to all *intents and purposes a direct infringement on the patent of the said co-plaintiffs.*

FRANCIS BRAMAH, of Pimlico, Engineer, swears,

That he thinks there can hardly be a difference of opinion between competent persons in this matter who may investigate the subject, as it appears to him that the defendants' patent is *essentially the same* as that part of the plaintiffs' patent which has the same object in view, both in object and modification of the apparatus for obtaining the proposed end, and

That he is of opinion that the defendants' patent is clearly an infringement of the plaintiffs' right.

DR. BIRKBECK, swears,

That the specification of the furnace and boiler of the defendants includes, unquestionably, the distinguishing features of the patent of the plaintiffs.

That he finds the air-tight furnace or fire-place, and ash-pit, and the vertical supply of fuel through a closed cavity in both specifications.

That the defendants' method of directing an additional quantity of air through the furnace and the application of the forcing air-pump, is the same as *employed* by the plaintiffs, and

That upon the whole, he considers the plan of the defendants *a copy of the plan* of the complainants, and consequently, if practised, an infringement of their patent.

MARC ISAMBARD BRUNEL, F.R.S. and Civil Engineer, the designer of a tunnel under the Thames, swears

That he feels no hesitation in giving it as his decided opinion, that the defendants have committed an *important and glaring infringement* on the patents of the complainants.

JACOB PERKINS, the Engineer, swears

That, looking at the leading features of the invention, no *practical engineer* would hesitate to declare that the specifications *are one and the same in all important parts*, and

WILLIAM FAWCETT, of Liverpool, Engineer, swears,

That he finds that the principle of plaintiffs' patent is *substantially different* from the defendants' patent.

That he is enabled to state from experience, that the method adopted and set forth in the plaintiffs' specification would never be available, but must on the principle thereof, prove entirely abortive.

That he has witnessed the most successful performance of the defendants' invention, and

That the two inventions are distinctly different.

Messrs. MAUDSLEY and FIELD, of Lambeth, Engineers, swear,

That the principle of the patent of the plaintiffs is altogether different in its object from that of the defendants, in as much as the plaintiffs' claim by their patent, to remove the inconvenience of smoke by driving the products of the fire, either under water, or otherwise submitting them to pressure; whereas the defendants' claim to have invented a means of generating steam more rapidly than by any other method hitherto discovered, by driving or drawing the fire through smaller tubes or flues than it could be made to pass through by the natural draught of the chimney, and

That they are enabled confidently to state, that there is *no similarity* between the two inventions,

CHARLES BLACKER VIGNOLES, of Furnival's Inn, Civil Engineer, and designer of a tunnel under the Thames, swears

That the defendants' is a *totally different* invention, both *in principle and detail*, and differs in every respect with the invention of the plaintiffs.

WILLIAM LAIRD, of Liverpool, Boiler Maker, swears

That he is fully competent, from his great experience in boilers, having made boilers to the extent of six thousand horse power, to judge of their respective merits and principles.

That the defendants' is a palpable imfringement upon the plaintiffs' patent.

JOHN FAREY, Civil Engineer, swears

That to the best of his judgment and belief, that which is described in the complainants' specification of the first part of their invention, is substantially the same invention as that which is described by fig. 3,* in the drawing annexed to the defendants' specification; for the fire is proposed to be made within a furnace or close fire-place included in the interior of the boiler, and surrounded by the water therein contained, the combustion of that fire being maintained by forcing air into the said close furnace by a pump or blowing cylinder with a moveable piston, or by any other instrument to blow air, in order that an adequate supply of air may be made to pass through the burning fuel without the necessity of using a high chimney—the *air so forced* into the close furnace being maintained therein in a state of *slight compression beyond the ordinary density of the atmosphere*, not only within that part of the furnace which contains the fuel, but also within the long flue which proceeds from the furnace through the water contained in the boiler, such compression being maintained by partially obstructing or restraining the exit of the unconsumed heated air, the smoke and heated gas from the extremity of the said flue, in order that by being retained within the furnace and its flues under some force of compressure, the said heated air and gas may more effectually give out its heat to the surrounding water. And this deponent further saith, that the above is a *fair* statement of the essential principle of the first part of the invention described in the complainants' specification, and also of the essential principle described and represented by fig. 3 in the defendants' specification. And this deponent further saith, that the mechanical arrangements and combinations by which the above principle is proposed in both specifications to be carried into effect are very similar for the fuel is to be introduced from

* This is the one given by us in our last volume as before referred to.

That he has no hesitation in stating that the two invention are *totally different and unlike*, and for different objects and purposes.

ALEX. NIMMO, Engineer, of Dublin, swears

That the principle of the plaintiffs' patent is totally different from the defendants' patent; for by the defendants' invention steam is generated by causing a very great quantity of heated air to pass through narrow flues without any intervening obstructions, and this obtained either by a blowing or exhausting machine, and whereby very important results are obtained; namely, a great saving of fuel, as well as greatly reduced space occupied by the boiler; whereas the plaintiffs' patent consists of an invention chiefly intended for removing the inconvenience of smoke, by forcing atmospheric air, by means of an air-pump, through an air-tight furnace, and against the resistance of a column of water or other pressure; and also for using the air after its expulsion for various purposes. And this deponent further saith, that he considers the method so proposed and set forth by the plaintiffs' are quite inapplicable to any practical purpose.

above the top of the boiler, into the furnace by the same expedient in in both specifications; namely, by means of an ante chamber, with its external door, and also an internal door between that ante chamber and the furnace: one of these doors being in all cases shut before the other is opened, fresh fuel can be introduced into the furnace when required, without permitting any considerable escape of the compressed air; also the air which is blown into the furnace is proposed in both specifications to be introduced partly below the fire-grate on which the burning fuel rests, and partly above that grate, if required; also the mode proposed in the defendants' specification for restraining the exit of the smoke, unconsumed heated air, and heated gas, is by the smallness of the passage through the long flue, which will not allow the quantity that must flow through it to pass without crowding, and occasioning as much resistance as is necessary to maintain a sufficient compression of the air that is contained within the furnace. In the complainants' specification, the exit of heated air and gas from the flue is proposed to be restrained by a *plate* or valve covering the aperture, at which the smoke and gas escape from the extremity of the flue; such plate being pressed either by any *weight or fluid*, or by any other *known means of producing the required resistance:* the pressure on that valve likewise is proposed to be regulated by its area, and by immersing it a sufficient depth beneath the surface of the water, through which the smoke must rise, and thereby be washed and *cleansed*.

No cash account in a merchant's ledger could be more accurately balanced than are the professional opinions in this case. There is not a position advanced in any of the affidavits on either side which is not flatly contradicted by some position advanced in those of the other. We have heard much of the certainty of the mathematical and mechanical sciences, and we are inclined to believe that very little difference of opinion would exist on mechanical subjects when considered abstractedly; but whenever a mechanical question is united with law, the mixture assumes all the uncertainty, absurdity, and extravagance of the latter ingredient; and even men of all denominations seem instantly to assume the legal profession, and to become advocates of a client whenever they happen to be connected with a litigated question.

There is not a man amongst the respectable deponents in this case, whose talents, integrity, and discrimination would not render valuable his opinion, on this or any other similar question, were it asked and given without the formality of an oath.

Every one of the gentlemen who have given affidavits in favour of Mr. Galloway, would, if consulted in a plain common-sense way about his invention, have told him, that he had made a mistake respecting the pressure of a column of water on the valve *c*, which could not be opened by any pressure of smoke, gas, or heated air below it for their escape, without admitting the water into the flue and fire, that the feeding apparatus which he *employs* is not made according to his *specification*, and that it has been the practice, from time immemorial, to erect chimneys narrower at the end where the smoke escapes than at the end where it enters; and therefore if, as he contends, the tapering of a flue, and the placing on its extremity a loaded valve be the same thing, he can have no patent right in an invention which he thus contends to be identical with a plan long known and practised. And, on the contrary, every one of the gentlemen who have given affidavits in favour of Mr. Braithwaite, if consulted in a plain common-sense way about his invention, would have told him, that his apparatus for generating steam was exceedingly like Mr. Galloway's apparatus for consuming smoke; and that he had either accidentally designed nearly the same arrangement of the different parts, or else that he had taken the general arrangement from Mr. Galloway's plan, and applied the apparatus in manner, and for a purpose very different from those claimed by that gentleman. Had the respective friends of the plaintiff and defendant taken upon themselves to perform this friendly office to the parties there would have been no trial.

If this view of the case be true, the following inquiries become important. Why a man's opinion should be rendered less valuable by his swearing to it, and in what manner a court of equity can obtain the true opinion of scientific men on any intricate scientific question.

The circumstances which lead to the first are these—a gentleman having a dispute to settle at law, calls upon his friends for their opinion to assist him; he explains to them the nature of the question, giving, of course, his own views of it with much minuteness, and they have too good an opinion of his integrity to suspect that he would mislead them in any one particular, and hence they necessarily adopt the same opinion themselves, and then set about expressing it in the most forcible manner; in which operation they are generally assisted by the lawyers, who, having more experience in these matters, just take the liberty of putting the affidavits into form. The desirable object allude to in the second inquiry may be fully obtained by all the gentlemen who intend to furnish the court with opinions holding meetings, and drawing up together one opinion as to the mechanical arrange-

ments, leaving, of course, the legal points to be debated by the lawyers.

We shall give the Lord Chancellor's decision of this singular question in a future number. The case at present stands thus:—The Lord Chancellor, after having heard both sides, said, "but the defendants say that you (the plaintiffs) have not used your machine; you cannot stir a step without showing that you have done so." Upon which the plaintiffs counsel said, "Oh, my Lord, we can get some body to *swear* that we have used it; and the defendants counsel hoped his Lordship would allow them to get somebody to swear that the machine in use in Mr. Galloway's manufactory had been made subsequently to the defendants patent," and his Lordship gave them both permission to swear away.

MR. BUCKINGHAM'S PROJECTED VOYAGE ROUND THE GLOBE.

A HIGHLY respectable meeting was held on the 23th instant, in the Theatre of the Royal Institution, Albermarle-street, of the subscribers and friends to a plan proposed by Mr. Buckingham, for making a voyage round the globe, by the route of India, China, Japan, and the Pacific Isles, for the purposes of discovery, civilization, and commerce.

Notwithstanding our maritime superiority and our extensive commerce, there were important portions of the globe with which we were very imperfectly, if at all, acquainted. This was the case, particularly with a considerable portion of the coast of Asia. Capttain Basill Hall, in speaking of the coast on the south-east of China, said, when navigating these seas he found all his charts wholly useless, and that where he found innumerable islands, if he were to judge by his charts, he would be in the interior of the country; and Sir Stamford Raffles, in a communication to the Batavian Society, after he was long resident in the East, declared that a great portion of the country on the coast was wholly unknown; that the island of Borneo, which was larger than any civilized country of Europe, was included in that description.

One great object of the undertaking which had never been incorporated with any systematic plan for a voyage of discovery, was laying the foundation for a future commercial intercourse, by leaving amongst the inhabitants of the countries visited, specimens of useful manufactures, and models of agricultural and domestic implements; together with such useful information as might lead to a harvest of intellectual and moral improvement. The want of an accurate knowledge of distant countries, when they were first opened to a trading intercourse, was often productive of overtrading, and consequent loss. Such accurate knowledge could in no way be so speedily obtained as by a voyage undertaken with that express object in view;

and for that purpose in was only requisite that a ship of sufficient size and competent equipments should be provided by the British public, and given as a donation to this great object. After which the ordinary operations of trading in the purchase and sale of commodities, and the conveyance of goods and passengers would defray all substances expense, without further risk or concern on the part of the subscribers.

Mr. Buckingham in speaking of his own qualifications for the undertaking, said, "from my cradle, the love of enterprize and the ambition of discovery and improvement have been my leading passions. I went to sea at nine years of age—obtained a maritime command before I was twenty-one—have visited in that capacity almost all parts of the world—the West Indies, North and South America, the Mediterranean, Turkey, Egypt, the Red Sea; the Persian Gulf, the East Indies, including Bombay, Ceylon, Madras, and Bengal—and have travelled by land far into the interior of Egypt, Nubia, Arabia, Palestine, Syria, Mesopotamia, Babylonia, Media, and Persia. I have adopted the costume, learnt the tongue, and accustomed myself to the manners of almost all the several countries named, and passed with safety and respect through each. I am in my forty-fourth year, and sufficiently strong, healthy, vigorous, and energetic for any enterprize of difficulty and danger,—and with enough of experience to assist my judgment, without extinguishing my zeal—while the books I have written, and the discourses or lectures I have delivered, of which not less than 100,000 different individuals in various parts of England have been the witnesses, will confirm my capacity to collect information, to record it in writing, and to impart it verbally to others."

Resolutions were passed for carrying the objects of the meeting into effect, which there is reason to hope will be successful, and ultimately, productive of important benefits to the world at large.

ON TRANSFERRING PRINTS TO THE SURFACE OF WOOD, AND EITHER REVERSING THEM OR NOT; AND ON MAKING AND APPLYING HARD WHITE SPIRIT VARNISH.

[From Journ. de la Société du Bas. Rhin. 1827.]

This process is very analagous to that formerly employed in transferring prints to the surface of glass, and to the back of which prints colours were afterwards applied so as in some degree to imitate oil pictures. Here, however, they are applied upon the surface of wood, such as cornel, sycamore, horse chesnut, satin wood, *aer wood*, or the curly veined maple, &c., which is afterwards to be varnished.

The wood having been planed smooth and even, is to have a slight coat of the best glue applied upon it; when this has become dry it must be rubbed with Dutch rushes, or glass paper, to remove the small filaments which the glue has raised, and render the surface

uniform. We then apply a layer of white alcholic varnish, taking care not to cross the marks left by the brush, and pass as few times as possible over the same place; it is then left to dry. We afterwards apply in succession, three, four, five, or six, other coats of varnish upon it, according as the varnish may be thinner or thicker.

The edges of the print are then to be cut close to the engraving; and it it must be laid upon a proper table with the impression downwards; it must be then uniformly moistened with a wet sponge, or in any other manner. When it has been equally and thoroughly wetted it must be placed between two leaves of blotting paper, in order to remove any drops of water. We then apply another coat of varnish over the surface of the wood; and before it is become dry, apply the moistened print upon it with the engraving downwards. In order to do this, we lay one edge of the print first upon the surface of the wood, holding it suspended by the other hand, and wipe successively over the back of the print in such a manner as to drive out all the air and prevent the formation of blisters. We then lay a sheet of dry paper upon it, and pass a linen cloth over every part of the print, in order to fix it securely upon the varnish. We must take great care to place the print steadily upon the varnished wood, lest we may make a false or distorted impression of it. We then leave it to dry; and when it has become thoroughly dry, we moisten the back of the paper with a sponge, and pass or lightly rub the fingers backwards and forwards over it repeatedly, so as to remove the moistened paper in small rolls curled up. When, however, the marks of the picture begin to appear, we must take care lest in rubbing, we should remove any portion of the paper upon which the impression is taken. When we find, therefore, that we can remove no more of the paper without incurring the risk of injuring the print, we suffer it to dry; in drying, the engraving will entirely disappear at the back of the print, it remaining covered with a slight film of paper. But, on again giving one coat of varnish it will be rendered entirely transparent. It must then be again suffered to become quite dry. If by chance we have raised any small parts of the engraving, we must retouch those defects with fine lamp-black and gum water, before we proceed to varnish, as we have before mentioned; great care must be used in laying on a second coat of varnish, passing rapidly over the retouched parts. When this last coat of varnish is become perfectly dry, we may remove any projecting part of the paper, and polish it with Dutch rushes steeped for three or four days in olive oil; we then remove the oil by rubbing with a fine linen cloth, and sprinkle it all over with starch or hair powder; this will absorb the least remains of the oil, and we remove it by first passing the palm of the hand over it, and then by carefully wiping or rubbing it with a fine linen cloth; we next apply three or four more layers of varnish, taking care to let it dry between each coat. When the last coat is become quite dry (in three or four days' time), we polish the varnish with a piece of fine woollen cloth, and chalk or whiting of the finest kind.

In order to prepare this fine chalk, we must grind the ordinary

chalk in a mortar with a little water; and when it is well ground, we add more water, and pour it into a glass vessel, suffering it to remain at rest for five or six minutes, it will then have deposited its coarser particles. We then decant the liquid, which holds in suspension the finer particles of the chalk; let it rest, and when the water has become clear we pour it off, and shall find the sediment in the form of a paste, and which we use to polish the varnish with. We must take care to use it in the moist or wet state; as, if it becomes dry it is impossible to preserve it in the minutely divided state, and we should run the risk of polishing the varnish in streaks. If, however, we would have the varnish still more shining, we must wash off all the remains of this fine chalk with water, and polish it with the palm of the hand only slightly moistened. But to have it still more brilliant, after having washed away all the chalk and suffered it to become quite dry, we must pass all over it a thin coat of varnish, either in the sunshine, or near a warm stove, in order that the varnish may be extended uniformly upon the surface.

White Spirit of Wine Varnish.

Rectified spirit of wine - - - -	24 ozs.
Fine sandarach - - - -	4
Fine turpentine - - - -	1
Spirit or oil of turpentine - - -	1
Camphor - - - - - - -	2 *gros.*

We must select the most transparent sandarach, and that which is the least yellow; but if it be not of the best possible kind, we must wash it in a weak lie of potash, and then in a large quantity of water, and let it dry perfectly. For the quantity above directed, we must take a bottle of white glass well dried, and of the capacity of forty ounces; and after pulverizing the sandarach, we reduce the particles of it to a kind of thin paste, by triturating it with some of the spirit of wine, and put it by degrees into the bottle. We likewise mix the turpentine and the oil of turpentine together, by rubbing them up in the same mortar; and when the turpentine becomes more liquid, we may increase its liquidity by adding some spirit of wine to it, and pour it into the bottle, when we must shake it for some time, in order to mix the materials well together. We likewise put the camphor into the mortar, and beat it up with some drops of spirit of wine; we then add a larger quantity of the spirit, which will entirely dissolve it; this is then to be poured into the bottle, and it must be again well shaken for some time, in order thoroughly to mix all the materials together. The bottle must then either be exposed to the heat of the sun or that of a warm stove, for ten or twelve days, taking care to shake it from time to time, and to unstop it, in order to suffer the vapour to escape; but finally it must be close stopped and the varnish kept for use.

On applying the Varnish to Wood.

We place the subjects which we would varnish, either in the sunshine or near a warm stove. We then apply six, eight, or ten coats

of varnish. We must take care never to apply a second coat until the former one has become quite dry. If we could give the piece of work a fine lustre, we may polish the varnish after the last coat is become quite dry, with finely washed chalk, applied whilst wet upon a soft woollen cloth. Or we moisten the palm of the hand and rub the varnish with it, until it has acquired a perfect polish. Before applying the varnish upon wood, however, we must always prepare it by a coat of glue.

On fixing Prints upon Wood, in their natural position, and removing the Paper from them.

We select a surface of any kind of wood, the size of the print; we then moisten a piece of thick drawing paper, of a proper size, and apply upon its surface a layer of thin glue; we then suffer it to dry, and give it two or three more coats of the same glue, letting it dry between each coat; we then prepare the surface of this paper, to receive the print, in the same manner as the wood was prepared, as described in the first part of this article, by coating it with several layers of spirit varnish. We then apply the print, and conduct the operation exactly as before, to the period when we remove the last portions of oil by means of starch, and give several layers of varnish. The wood being then prepared to receive the print by the coat of glue, and several layers of varnish applied in the manner before described, we fix upon it the leaf of drawing paper, bearing the print upon its prepared surface. We then apply a coat of varnish to the wood, and affix the prepared paper and print upon it whilst it is still tacky; and so as to prevent the forming of any blisters of air-bubbles between them. When we think that the varnish is become hard, with the help of warm water and a sponge, we moisten the glued paper which covers the whole; we then remove that paper, which readily comes off; and with the aid of the warm water and the sponge we cause the glue to disappear from the varnished surface of the print; we then polish it with prepared chalk, and finish it, as before stated. This process may also be employed, not only to apply prints upon the surface of wood, but also upon metals, &c.

MANN'S PATENT LOCOMOTIVE AIR-ENGINE.

In our report of this patent given at p. 164 of our last volume, we were very brief, considering that the patentee had made but little progress in the production of an acting machine to propel a carriage by the use of compressed air. Similar propositions have been made by various scientific individuals, but they have never yet appeared in a form calculated to afford a probability of success, owing chiefly to the difficulties presented by the circumstance of the power being *constantly decreasing* in its effective force.

It is proposed to employ a series of strong metallic recipients, similar to the cylindrical vessels used for portable gas, into which

thirty or more atmospheres are to be condensed by the power of a steam-engine, water-mill, or any other adequate prime mover. A sufficient number of these vessels are so stowed in a case adapted for the purpose, which is to be fixed underneath the carriage; a tube communicating with all the recipients is to convey the compressed air to two working cylinders, with the usual apparatus common to high-pressure steam-engines, the piston rods of which will give motion to a crank on the axis of the hind running wheels. It is proposed to work expansively, and to vary the cutting off the stroke according to the degree of elasticity of the air.

The velocity proposed to travel, at the rate of about 14 miles per hour, which, it is calculated, will require 2000 cubic feet of air of the natural density to propel a carriage, weighing with its load, two tons. When the roads are in a bad state, it is intended to charge the vessels with a greater number of atmospheres to overcome the increased resistance.

The patentee states, that the carriage is *constructed* to carry seventy-five cubic feet of compressed air, which, at a density of thirty-two atmospheres, is sufficient to propel it fourteen miles; and if the air was compressed to be equal to forty-eight atmospheres, that quantity would propel the carriage twenty-three miles; if, to sixty-four atmospheres, thirty-four miles. The average cost of the power is calculated to be about one penny per mile: that is, if a steam-engine be employed to effect the compression of the air into the recipients, such power would cost in coals one penny, and produce a power of expansion in the condensed air competent to propel the carriage one mile: this is, however, only a small part of the expense.

Reference to drawing.—Fig. 1, Plate VI., exhibits a side elevation of the carriage.

Fig. 2 is a view on an enlarged scale of the reservoir of air, consisting of fifteen vessels, containing seventy-five cubit feet each.

Fig. 3 a single vessel.

IMPROVED PROCESS FOR MAKING VERMILLION.

Kirchoff first shewed that by commingling and triturating mercury, sulphur, and potash together, and applying heat, cinnabar might be obtained; but the process was uncertain, and gave variable quantities of vermillion. The following is a process recommended by M. Brunner:—

300	parts of mercury.
114	sulphur.
75	caustic potash.
400 to 450 ..	water.

The mercury and sulphur are first triturated together from three hours to a whole day, according to the quantities used. When the mixture is homogenous the solution of potash is added, the tritu-

ration continued, and the mixture heated in an earthen vessel or porcelain, or, if on a large scale, of iron. At first, the stirring must be constant, afterwards from time to time. The heat should be sustained at 113°; it should never pass 122°. The liquid should not be allowed to diminish by evaporation, but be made up. After some hours the mixture will acquire a reddish brown colour, and then great care is required: the mixture must not pass 113°. If it becomes gelatenous, a little water should be added; the mixture of sulphur and mercury should always be in a pulverulent form in the liquid. The colour becomes more and more brilliant, and at times increases with astonishing rapidity: when it has attained its highest intensity the vessel is to be taken off the fire, but still to be retained warm for several hours. The time necessary for the application of heat appears to be directly as the quantity operated upon. If the proportion above be in grammes (about 15¼ grains each), the red colour will appear in about eight hours, and the operation be finished in about twelve hours.

The cinnabar is then to be washed, and the small quantity of metallic mercury that may be present separated; from 328 to 330 parts of vermillion will be obtained of a colour equalling that of the native cinnabar, and far surpassing that of cinnabar obtained by sublimation. The mercury and the potash should be quite pure.—*Annalen der Physik*, 1829.

STRENGTH OF WINE AND OTHER BOTTLES.

M. Collardeau has constructed a machine for the purpose of trying the strength of wine bottles. It has been presented to the Academie des Sciences, and reported upon by M. M. Hachett and D'Arcet. The bottle to be tried is held at the neck by means of a lever, having three branches, which grasp is below the ring; being then filled with water, it is connected by means of pipes, with a forcing pump, the pipe having a cap furnished with leather, which is firmly held down by the apparatus upon the mouth of the bottle, the pressure upon the parts here increases with the pressure of the water within the bottle. Besides the pump, levers, and connecting pipe, there is also a manometer connected with the interior of the bottle, to shew the pressure exerted. When a bottle is burst in this way by the hydraulic press, no violent dispersion of its parts takes place, unless indeed, in place of being filled with water, a portion of air is left in; then when it breaks it flies to pieces, and would cause danger if exposed.

Bottles intended for the manufacture of brisk champagne or burgundy, being tried, were found to break with a force between twelve and fifteen atmospheres, exerted from within outwards: a few rose to eighteen atmospheres. Bottles which had contained champagne of the finest quality, broke at the same pressure. Bottles which resisted the pressure of twelve atmospheres usually broke with one or

two atmospheres more, but the number of these was small. The fracture of bottles in the manufacture of brisk champagne is from 10 to 20 per cent.; and in certain cases, which however are rare, almost the whole have been broken. It appears quite certain, that during the fermentation of the wine, the pressure rises above twelve atmospheres, but the full extent can only be ascertained by careful experiments made by the wine proprietors.

The commissioners then remark, that the best bottles intended for brisk wines are too weak; the general fault is want of strength and uniformity in the belly of the bottle, especially at the junctions with the neck and with the bottom.

As the greater number of bottles for brisk wines are of the same quality, it becomes a question why some should break and others not. This difference is supposed to depend upon the form of the neck and quality of the cork, allowing a little gas to escape in some cases and not in others. If the bottles and corks were all alike, all those which contained the same liquor at the same temperature would probably break at the same pressure. The only means of avoiding fractures is, either to make the bottles sufficiently strong, or to allow a little escape of gas by the cork. The least thickness of glass in the belly of the bottle should be 2 millimetres, (·079 of an inch,) but generally it is only 1 millimetre at the part next to the bottom. —*Bull. Univ.* E. xiv. 80.

MISCELLANEOUS.

Manufacture of Bicarbonate of Soda.—Mr. Creuzberg has found a ready mode for the manufacture of this salt, in the circumstance that the dry alkalies absorb carbonic acid much more quickly than those in solution. Carbonate of soda is therefore deprived o much of its water by efflorescence, and is then subjected to a current of carbonic acid gas until the bicarbonate is formed; the time when this takes place is rendered evident by the evolution of heat, and the exhalation of water, which is deposited in drops upon the interior of the vessel.—*Bull. Univ.* A. xiii. 134.

Alloy for the Construction of Pumps and Cocks.—This alloy consists of 4 parts of tin, 4 of zinc, and 1 of antimony; these metals, when fused and well mixed together, have been found well suited to make good pumps. Cock metal is usually an alloy of lead, zinc, and antimony, to which more or less tin is added. The alloy described as good for pumps, is fit for cocks, but one to be mentioned is still better: of the two parts of a cock, namely, the box and the plug, the latter should be rather harder than the former, and therefore contain more antimony. An alloy of 80 parts of tin, with 20 of antimony, is well suited for the plug, and one consisting of 86 parts of tin, and 14 of antimony, for the boxes of cocks.—*Industriel de Bruxelles.* F. xiv. 36.

A Village Lighted by Natural Gas.—The village of Fredenia, in the western part of the state of New York, presents a singular phenomenon. The village is forty miles from Baffalo and about two from Lake Erie; a small but rapid stream called the Canada-way, passes through it, and after turning several miles, discharges itself into the lake below; near the mouth is a small harbour with a light-house. While removing an old mill, which stood partly over this stream in Fredenia, three years since, some bubbles were observed to break frequently from the water, and on trial were found to be inflammable. A company was formed, and a hole, an inch and a half in diameter, being bored through the rock, a soft fetid limestone, the gas left its natural channel and ascended through this. A gasometer was then constructed, with a small house for its protection, and the pipes being laid, the gas is conveyed through the whole village. One hundred lights are fed from it; more or less at an expense of one dollar and a half yearly for each. The flame is large, but not so strong or brilliant as that from gas in our cities; it is, however, in high favour with the inhabitants. The gasometer, on measurement, collected 80 cubic feet in 12 hours during the day; but the man who has charge of it, says, that more might be procured with a larger apparatus. About a mile from the village, and in the same stream, it comes up in quantities four or five times as great. The contractor for the light-house purchased the right to it, and laid pipes to the lake, but found it impossible to make it descend, the difference in elevation being very great. It preferred its old natural channels, and bubbled up beyond the reach of his gasometer. The gas is carboretted hydrogen, and is supposed to come from beds of bituminous coal. The only rock visible, however, both here and to a great extent on both sides along the southern shore of the lake, is fetid limestone.

Sulphate of Potash and Copper.—When equal quantities of sulphate of potash and sulphate of copper are mixed, a particularly clear green precipitate is gradually formed, which Vogel considered as a subsalt. Having been analyzed by Brunner, it appears to consist of

Oxide of Copper	39·23
Potassa	12·12
Sulphuric Acid	39·70
Water	8·94
	100·00

New Stereotype Plate.—The improved plate is intended for maps, and other subjects in which drawing and lettering are combined. Blank type, quadrats, or spaces, are to be cast of the usual height of type, so that when set up they will stand even with the face of the letter. These are to be set by the compositor with the required names standing in their proper places; from this a block is to be cast in the usual way of forming stereotype plates, when the lines of the map or other drawing are to be formed by the graver.—*Franklin Journal.*

French Method of Preserving Butter.—The following improved process for the preservation of butter has lately been adopted in France:—Take one part of loaf sugar, one part of saltpetre, and two parts of pure salt; mix and reduce them to a very fine powder. As soon as butter is perfectly washed (to extract the buttermilk) work into it one ounce of the above mixture to each pound, and pack it immediately, and as closely as possible, into pots, and smooth the tops over carefully; then cover the pots over with a fine linen cloth, and tie a piece of wet parchment (or bladder) over the whole. After a few days it will be found that the butter has settled, and no longer fills the pots completely, they must then be filled up, taking care that no space be left; then pour over the top a small quantity of butter, melted to a low temperature, sprinkle over the surface a small quantity of the above mixture, and stop the pots as tight as possible to exclude the atmospheric air. They should not be again opened until the butter is wanted for use. In this manner butter may be preserved several years; and has been found at the end of two years to be as fine flavoured as in the first month.

It should be remarked, that butter prepared in this manner is not fit for use in less than a fortnight after being packed: by that time it will have acquired a very agreeable flavour, and so fresh that persons who are in the habit of eating salted butter, can hardly believe that this has ever been salted at all.

On opening the pots care should be taken to use the top first, and not to cut down by the side. And if all the butter contained in one pot is not to be used immediately, what remains should be covered with the same care as at first; or it may be kept covered with brine.

Butter may also be preserved by working it into a small portion of pure honey, which imparts to it a very agreeable flavour, and renders it very valuable for aged persons, and those who have weak stomachs. Butter preserved in this manner, has been kept for several years, and showed no tendency to become rancid. One ounce of honey to the pound.

Mortality among Leeches during Storms.—That atmospheric changes have a remarkable influence upon leeches is a well established fact. In 1825, M. Derheims, of St. Omer, ascribes the almost sudden death of them at the approach of, or during storms, to the coagulation of the blood of these creatures, caused by the impression of the atmospheric electricity. This opinion, which at that time was the result of theory, he confirmed by direct experiment.

Preparation of Sugar from Starch.—M. Heinrich says, that from one to two parts of sulphuric acid for each 100 parts of potatoe starch is sufficient, if the heat applied be a few degrees above 212° F.; and also, that then two or three hours are sufficient to give crystallizable sugar. He applies the heat in wooden vessels by means of steam.

LIST OF NEW PATENTS SEALED.

BAKING.—To R. Hicks, of Conduit Street, Hanover Square, Middlesex, for a machine to be applied in the process of baking.—Dated 29th June, 1830.—Specification to be enrolled in Six months.

REFINING.—To E. Turner, of Gower Street, Middlesex, M. D. and W. Shand, of the Burn in Kincairdinshire, for a method of purifying and whitening sugar or other saccharine matter.—29th June, 1830.—Six months.

REFINING.—To M. Poole, of Lincoln's Inn, for improvements in the apparatus for refining sugar.—29th June, 1830.—Six months.

MECHANICAL POWER.—To S. Parker, of Argyle Street, Oxford Street, for improvements in producing mechanical power from chemical agents.—29th June, 1830.—Six months.

LAMPS.—To S. Parker, of Argyle Street, Oxford Street, for an improved lamp.—29th June, 1830.—Six months,

SPINNING.—To R. Roberts, of Manchester, for improvements in the machines known by the name of mule, billy, jenny, jack, stretching frame, &c.—1st July, 1830.—Six months.

LOCO-MOTIVE PLOUGH.—To J. H. Clive, of Chell House, Stafford, Esq. for improvements in the construction of loco-motive ploughs, harrows, and other machines and carriages.—1st July, 1830.—Six months.

LOOMS.—To J. H. Sadler, of Praed Street, Paddington, Middlesex, for improvements in looms.—1st July, 1830.—Six months.

METALLIC SUBSTANCES.—To M. Uzielli, of Clifton Stree, Finsbury Square, Middlesex, for improvements in the preparation of certain metallic substances, and the application thereof to the sheathing of ships and other purposes.—6th July, 1830.—Six months.

HORSE BITS.—To J. Surman, of Hounslow Barracks, Middlesex, Riding Master in the Tenth Hussars, for improvements on bits for horses and other animals.—6th July, 1830.—Two months.

CLEANSING WHEAT.—To W. Tuxford, of Boston, Lincoln, for a machine for cleansing or purifying wheat, grain, or other substances.—6th July, 1830.—Six months.

PRINTING MACHINE.—To E. Cowper, of Streatham, Place, Surrey, and E. Cowper, of Suffolk Street, Pall Mall East, Westminster, for improvements on printing machines.—19th July, 1830.—Six months.

STEAM CARRIAGE.—To J. Rawe, Jun. of Albany Street, Regent's Park, Middlesex, and J. Boase, of the same place, for improvements in steam carriages and in boilers, and a method of producing increase of draft. 19th July, 1830.—Six months.

STEAM BOATS.—To T. Bulkeley, of Albany Street, Regent's Park, M. D. for improvements in propelling vessels, which improvements are also applicable to other purposes.—19th July, 1830.—Six months.

BOILERS.—To W. Taylor, of Wendesbury, Stafford, Engineer, for improvements on boilers and apparatus connected therewith, applicable to steam engines and other purposes.—19th July, 1830.—Six months.

FERMENTATION.—To E. Riley, of Skinner Street, Bishopsgate Street, Middlesex, for improvements in the process and apparatus for fermenting malt and other liquors·—19th July, 1830. Six months.

WOOLLEN CLOTHS.—To G. Oldland, of Hillsley, Gloucester, for improvements on the apparatus for shearing and dressing woollen cloths and other fabrics.—22nd July, 1830.—Six months.

DESCRIPTIVE ACCOUNT OF ALL THE

PATENTS ENROLLED BETWEEN 20TH JULY AND 20TH AUGUST 1830.

Particularizing the Offices in which the Specifications may be inspected, with the Dates of Enrolment.

DRAG FOR CARRIAGE WHEELS.—To George Frederick Johnson, of Canterbury, Kent, Tunbridge Ware Manufacture, a patent for " a machine or apparatus which is intended as a substitute for drags for carriage wheels and other purposes," was granted on the 26th of January, and the specification was deposited in the Enrolment Office on the 26th July, 1830.

The substitute for drags here proposed, consists in the application of a friction band or brake on the nave of each of the hind wheels. The method of producing the pressure of the drags is represented by fig. 8, Pl. VII. where *a* shows a lever extending within the rach of the guard which turns upon the fulcrum *b*, and acts upon the bar *d d* at *c*. This bar *d d* is connected by the pieces *f f* to the brakes *e e*, which are supported from the axis, and kept clear of wheels when not required.

When the drags are so applied to wheels with wooden naves, a projecting iron ring must be fixed upon the nave for the drag to act upon.

Drags on this principle have before been proposed: they would be found more convenient in application than the usual plan of introducing under the wheel, an iron shoe, which drags upon the ground, and produces sufficient friction to prevent the too rapid descent of the carriage down hill, as it can be applied and removed without stopping; but it has an important defect in common with the locking chain used to stop occasionally the motion of some waggon and cart wheels. This objection is the unequal wear of the wheel tyre; as that part of it which drags upon the ground when the wheel is stopped, will necessarily be so much worn as to render the plan in many instances very objectionable.

CANDLES.—To Thomas Bulkeley, of Richmond, Surrey, Doctor of Physic, a patent for " a method of making or manufacturing candles," was granted on the 26th of January, and the specification was lodged in the Enrolment Office on the 26th of July, 1830.

Dr. Bulkeley's method of manufacturing candles comprehend

first, a plan of making tallow candles with an exterior casing of wax, and secondly, a plan of saving in the material used for wicks, and at the same time of obviating the necessity for snuffing the candles.

He uses a metallic mould of the description generally employed in the manufacture of mould candles, and fills it with melted wax. Now as the portion of the wax which is in contact with the interior surface of the mould will become, by the conducting powers of the metal, first cooled or set, as it is termed, the wax remaining fluid in the centre of the mould is poured off, leaving within the mould a hollow cylinder of wax, which is afterwards filled with tallow, or any other material which melts at a lower degree of temperature than the wax.

With respect to the wick, the patentee introduces a small thread *a*, fig. 9, Pl. VIII. up the centre of the candle, for the purpose of constituting a guide for a short cotton wick *b*, which is platted with a piece of straw within is to receive the thread. Now this short wick rests on the surface of the tallow, which it raises by its capillary attraction for the supply of the combustion; and as it descends upon the thread as the tallow is melted, the top of it is never removed so far from the tallow as to carbonize and require snuffing, which is the case with wicks of the ordinary construction.

Wax candles have been usually made by suspending the wicks and pouring melted wax upon them until they are of sufficient thickness, and they are then rolled between two plane surfaces till they become perfectly smooth and cylindrical. This process has been found necessary from the difficulty of removing wax candles from moulds. This difficulty Dr. Balkeley proposes to get over in the following manner:—he provides a block (represented at figs. 10 and 11,) with a hole in one end, somewhat exceeding in diameter the candle, and also a small mallet, which we presume must be of peculiar form, as a drawing is given of it in the specification. He places the piece of wood on the end of the mould with the hole to receive the end of the candle, and strikes two or three smart blows with the mallet, by which the candle is detached from the mould.

SHEATHING SHIPS.—To John Revere, of New York, in the United States, now residing in St. James's Street, Westminster, M. D. a patent for "a new alloy or compound metal applicable to the sheathing of ships and various other useful purposes," was

granted on the 28th of January, and the specification was enrolled in the Petty Bag Office on the 28th July, 1830.

The alloy proposed by Dr. Revere for sheathing plates, consists of ninety-five parts, by weight, of zinc, and five parts of copper; which are to be incorporated by melting them in separate vessels, because the heat necessary to melt the copper would exceed the heat which dissipates zinc. When the copper is melted, the melted zinc is added to it in small quantities at first, and the metals incorporated by stirring, at the same time covering the mixture with charcoal or common salt to prevent the evaporation of the zinc.

The patentee does not confine his claim to the proportions named, but states, that they may be varied from ninety-one of zinc and nine of copper, to ninety-nine of zinc and one of copper; but he states, that he finds that ninety-five and five are the best proportions, as a greater quantity of the zinc will render the alloy more oxidisable, and a greater quantity of the copper will render it more brittle. This compound metal is then to be manufactured into plates by rolling in the usual manner.

CANDLES.—To Charles Taverner Miller, of Piccadilly, London, Waxchandler, a patent for "certain improvements in making or manufacturing of candles," was granted on the 4th February, and enrolled in the Enrolment Office on the 3rd of August, 1830.

The improvements contemplated by this patentee consists in the use of a small glass ring, which is placed over the wick, and descends as the candle burns. The object in view, is to prevent the candle from wasting aud guttering; which it effects by the glass ring conducting a greater quantity of heat to the centre of the candle than that which reaches the exterior: so that candles provided with this ring burn hollower in the centre than others, and the exterior tallow or composition of which the candles are made, stands higher and descends to the wick as soon as it is melted.

The method of manufacturing the candles with the glassings, as described by the patentee, consists in putting the ring over the wick after it has been placed in the centre of the mould; which being inverted as it is when filled with the material to constitute the candle, the ring descends until it reaches that part of the conical extremity of the mould which is equal in diameter to the exterior of the ring, when it rests and becomes fixed in the candle.

From an experiment which we have witnessed with spermaceti candles made by Mr. Miller, according to his patent, it would appear, that the plan will answer the purpose intended.

RICE CLEANSING.—To Melvil Wilson, of Warnford Court, Throgmorton Street, London, Merchant, a patent for "an improved method of preparing and cleansing poddy, or rough rice," was granted on the 6th of February, and enrolled in the above office on the 6th of August, 1830.

This patent is the communication of a foreigner, residing abroad, and the invention consists, in the use of mortars with solid bottoms, and sieve sides, made of wire gauze, or perforated metal plates, strengthened by ribs of strong wire.

The pestles are worked by a series of cranks upon the same axis, as shewn at fig. 7, Plate VII.

The intention of the sieve sides of the mortars, is, that the rice may pass through as soon as it is cleaned, so as not to be heated by the subsequent operation of the pestles.

ORNAMENTAL TILES, BRICKS, AND QUARRIES.—To Samuel Wright, of Shelton, Staffordshire Potteries, a patent for "a manufacture of ornamental tiles, bricks, quarries, for floors, pavements, and other purposes," was granted on the 26th of January, and enrolled in the Enrolment Office on the 26th July, 1830.

To have brick floors which shall, in appearance, resemble the the different patterns of floor cloth or carpeting, seems to be the object of this patentee. Instead of making flooring, bricks, tiles, and quarries, of the materials usually employed for those purposes, he makes them of potters' clay, which he colours variously, according to the patterns which he proposes to imitate. The tiles, bricks, &c. which constitute the ground of the floor or neutral colour, is indented with blocks of the form of the intended patterns, and the indentations are filled up with the prepared clays of the proposed colour.

There is but very little novelty about this invention, and there are but few instances where floors of the description contemplated would be desirable.

SKAITS.—To James Cobbing, of Bury St. Edmonds, Cordwainer, a patent for "certain improvements on skaits," was granted on the 26th of January, and the specification was lodged in the Enrolment Office, on the 23th of July, 1830.

Instead of the usual method of strapping the skaits to the feet, Mr. Cobbing proposes to attach them to the boots or shoes of the skaiter by means of metallic plates and screws. He makes the boots with iron or brass plates between the leathers constituting the soles: and in each of these plates there are two holes for the reception of hooked projections from the skait, which being inserted in the holes, is secured therein by a binding screw, which forces up the heal of the skait and prevents the projecting hooks from escaping from the holes of the sole plates.

A second method of attachment is described, by which the skaits may be fixed to shoes without having the metallic plates made into the soles; and this consists of two plates of iron extending across the sole, the one near the toe and the other near the heal, and these plates are bent up on each side and secured by screwing against the edges of the sole. To these cross plates the skaits which are made without any wooden frames are secured by screws pressing against their sides.

That these methods of attaching skaits is better than the strapping, when the shoes are sufficiently strong, we will readily admit, but that they are the best that can be devised, or that they will come into general use, is nearly impossible, from the multiplicity of ways in which the same thing may be effected.

HYDRAULIC ENGINE.—To Edward and James Dakeyne, both of Darley Dale, Derbyshire, Merchants, a patent "for a machine or hydraulic engine for applying the power or pressure of water, steam, and other elastic fluids, to the purposes of working machinery, and other uses requiring power, and applicable to that of raising or forcing of fluids," was granted on the 21st of January, and the specification was enrolled in the Petty Bag Office, on the 21st of July, 1830.

This invention consists of a hollow spherical vessel, having within it a moveable globe, of a diameter considerably smaller than the interior diameter of the hollow sphere. From the upper part of the interior ball proceeds a tapering rod, which passes through a large hole in the hollow sphere, and turns with a conical motion, giving motion to a horizontal crank and a train of wheels. To the equator of the ball, regarding the tapering rod as its pole, is attached a flat ring, which extends to and fits steam tight wiihin the hollow sphere. On one side of this ring a notch is made, to admit two communications, the one for the ingress and the other for the egress of the steam, or other fluid by which the machine is to be put in motion.

Now suppose the ring to be raised on the side next to the passages, the steam, water, or other actuating fluid, can enter, but cannot pass round to the egress passage without raising the ring on the opposite side, and it cannot, from its connection with the crank, be raised on the opposite side without causing the tapering bar to describe a conical motion, which is converted into a circular motion through the instrumentality of the crank.

DISTILLATION.—To Robert Busk, of Leeds, Yorkshire, a patent for certain "improvements in apparatus used for distilling and rectifying," was granted on the 26th of January, and specified on the 26th of July, 1830, in the Enrolment Office.

This invention, which is said to be the communication of a foreigner residing abroad, consists in the employment of a series of vessels placed in succession over the still to be partially filled with the liquid to be distilled, and so arranged with respect to communicating pipes and passages, that the vapour passed over the surface of the liquid in each of the vessels without having to pass through any of it. An adjusting pipe descends from about the middle of each vessel to the one below it for regulating the quantity in each. A large cylinder extends from top to bottom through the centre of all the vessels, and round this the vapour passes in its progress from the still to the upper part of the apparatus.

WIRE WEAVING POWER LOOMS.—To Thomas Robinson Williams, of Norfolk Street, Strand, London, Esq. a patent for "improvements in power-looms, applicable to the weaving of wire and other materials," was granted on the 6th of February, and enrolled in the same Office on the 6th of August.

The improvements contemplated in this invention apply to the arrangements for letting off the warp, and taking up the web with a greater degree of uniformity than has hitherto been done in looms for weaving wire. The different wires which constitute the warp are wound on a series of reels or small cylinders which are placed in a row, the one rising over the other in an oblique direction; so that the wires when brought to a warp roller extending across the loom, may be readily adjusted to any required distance from each other. The wires are brought from these reels and made to bend over one roller and under another, between which they are pressed to produce any required degree of tension in letting them off as the work proceeds.

The taking-up roller is put in motion by a pushing lever acting upon a ratchet wheel in the usual manner; but by this plan the the quantity taken up at one time cannot be less than the size of one of the ratchet teeth, supposing the wheel and roller to be of equal diameters; and thus the action of the batton would, by the different extent of its strokes, become irregular, and cause a want of uniformity in the strokes. To remedy this, Mr. Williams places on the web, which is permitted to descend between the beam over which it first passes and the taking-up roller, a loose roller loaded with heavy weights suspended from its axis, so as to produce an uniformity of tension, notwithstanding some irregularity in the action of the taking-up roller. The motions of the batton, shuttle, and other moving parts of the machine are obtained from the main axis of the loom in the usual manner, and therefore need not be particularly noticed here.

WOOLLEN CLOTH.—To Joseph Chiseld Daniell, of Limpey Stoke, Wilts. Clothier, a patent for "certain improvements in the machinery applicable to the manufacturing of woollen cloths," was granted on the 6th of February, and enrolled in the above office on the 6th of August, 1830.

Mr. Daniell's attention seems principally directed to that branch of the woollen manufactures connected with the finishing or giving a fine surface to the cloth, through the instrumentality of the gig-mill, for we have frequently had occasion of late to record his improvements in this machine. His present improvement consists, in a method of making the teasles act upon the cloth in an oblique direction, with regard to the direction of the threads of the warp, by which the pile can be more effectually raised, and a finer surface ultimately given to the cloth. The teasle drum is connected with the axis, by which it is supported and turned by four rods, which are jointed both to the interior of the drum and to the centre of the axis, constituting a kind of gimbles, permitting the drum to revolve in a position with its axis of rotation, making an angle with the axis by which motion is communicated to it. In addition to this, each pair of teasle frames are made, by connecting rods moving on a fulcrum fixed on the surface of the drum between them, to carry the teasles in different directions during the operation of the mill. The end motion of the teasle frames can be readily understood by comparing their motion, to that of the two sides of a common paraller rule. There is only this difference, Mr. Daniell makes his con-

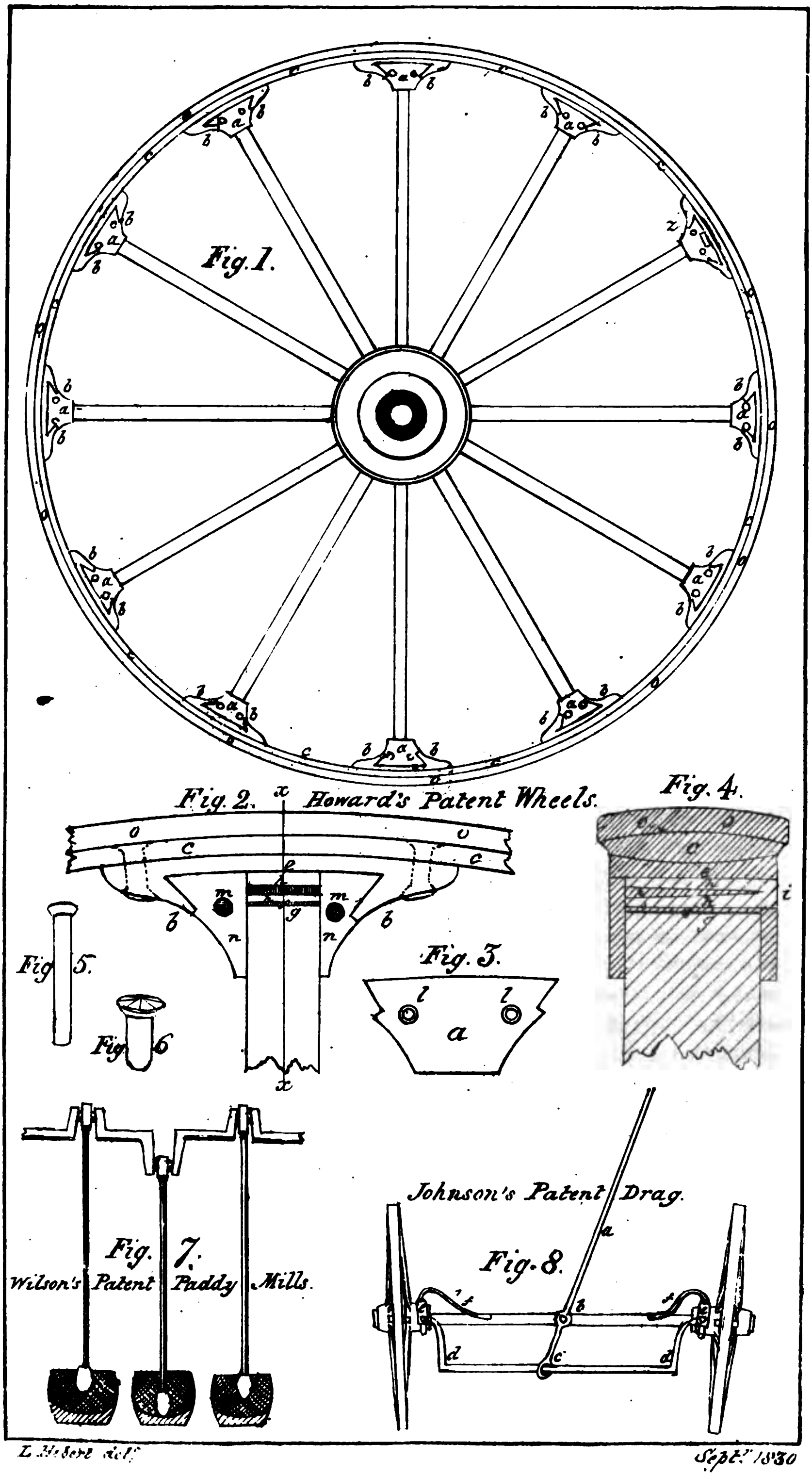
necting bars turn on a centre or fulcrum attached to the teasle drum, and they are joined to the teasle frame by connecting links at right angles to the connecting bars. By this contrivance the parallel end motion of the frames is obtained without their approaching to, or receding from, each other. At the ends of the mill are guide frames and cams, to produce the various motions and to preserve the drum in any required position while in action.

The whole of these arrangements evince much ingenuity, and are well calculated to improve greatly the appearance in woollen cloth of every quality. If, however, Mr. Daniell would devote his fertile inventive genius to the introduction of some method of manufacturing woollen cloth to wear better as well as to appear finer, we are convinced he would obtain as much patronage from the consumers of the article as he at present does from the manufacturers.

Carriage Wheels.—To William Howard, of Rotherhithe, Surry, Iron Manufacture, for "improvements in wheels for carriages," was granted on the 27th of February, and the specification was deposited in the Enrolment Office, on the 23rd August, 1830.

A copy of this specification having been kindly lent to us by the patentee, we shall avail ourselves in the following description of the greater part of its contents; for although it relates to a very simple contrivance, it is one that is calculated to effect a very important improvement in our common carriage wheels; to render them capable of bearing greater loads, and to last much longer, without adding materially to their weight and cost. The arrangement of parts, and the mode of putting them together, we are happy to observe, are also such as every common wheelwright is competent to effect; so that this class of artizans will not be injured by the benefit the public will derive from their invention.

"In the ordinary mode of constructing cart, and other carriage wheels for travelling in the common road, the connecting of the spokes or radii to the fetloes or wooden periphery is very unstable, and renders the wheel liable to an earlier derangement or dislocation of its parts, than by my improved method of connecting those parts, which has besides the advantage of more firmly uniting the spokes or radii to the centre or nave of the wheel. A further advantage I conceive results from my improvements, that of adapting an *iron* ring as a substitute for the ordinary wooden fetloes, by which that part of the wheel, and in consequence the



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other part of the wheels, are rendered stronger and more durable, owing to the wooden felloes being liable to much earlier decay, besides becoming loose in their mortices from the alterations of form produced by the expansion and contraction of the wood according to its state of dampness or dryness.

"Having thus stated the object of my said improvements, I proceed to describe the means I adopt to carry the same into effect; and in order that my mechanical arrangements may be fully and clearly understood, I annex to my said description the following drawings for the purpose of elucidation." (These drawings we have somewhat curtailed and adapted to our work.)

Fig. 1, Pl. VII. exhibits an elevation of a cart or waggon wheel with the improvements, on a scale of four fifths of an inch to a foot.

Fig. 2, is a plan of a metallic box denominated a *spoke-shoe*, rivetted to a portion of an iron ring *c*, called a *shoe-ring*, over which is screwed the tire *o*.

Fig. 3, is a plan of a thick iron-plate, which fits into a corresponding cavity in the spoke-shoe fig. 2; it is detached to shew the manner of fixing the spoke in the shoe.

Fig. 4, is a transverse section of fig. 2 in the direction of the dotted lines *x* marked thereon.

Fig. 5, is a long countersunk rivet by which the plate fig. 3 is rivetted to the shoe fig. 2 at the back thereof.

Fig. 6, is another strong rivet by which the shoes are fastened to the filloes.

"In the drawing fig. 1, the centre or nave, and radiating spokes, are of the common form and kind, and therefore require no further explanation: my improvements consist in the addition and application of a series of metallic boxes marked *b a b*, which, as before mentioned, I demominate *spoke-shoes*, as they receive the ends of the spokes; and they are connected to the shoe-ring *c c c*, &c. by which arrangement, combined with the wedges or keys hereinafter described, the component parts of the wheel are brought into solid contact, and rendered more firm and durable than by the ordinary mode of construction." This figure is merely intended to shew the *application* of the improvements to an ordinary wheel, it being too diminutive to explain satisfactorily the exact *structure* of the novel parts. Accordingly, in the other figures, namely, 2 to 6, the various parts are represented on a scale of three inches to the foot, or one fourth the size (*linear measure*) they are used in a wheel of five feet in diameter, and having a breadth of tire of 3½ or 4 inches.

In the plan fig. 2, is exhibited the principal part of a spoke-shoe, (which may be made of any metal or alloy, but the preference is given to cast-iron) the cover plate *a*, (represented at fig. 3,) being detached to shew the cavity for the reception of the spoke. A series of these shoes, consisting of a similar number to that of the spokes required for the wheel, are fixed equidistantly, by the strong rivets represented at fig. 6, to the internal surface of a wrought-iron ring, called as before stated, the shoe-ring: one of the edges of this ring is exhibited at *c c* fig. 2, and in the elevation of a wheel at fig. 1. When the several shoes have been firmly secured (by these, or other well known means) and the spokes have all been driven into the nave, and the outer ends of the spokes prepared to fit tightly into the sockets of the shoes, they are all put or forced therein sideways, the plates *a a* being detached for that purpose.

The last mentioned operation is performed in such a manner as to leave a series of nearly uniform spaces of about half an inch (rather less than more) between the ends of the spokes, and the ends of the sockets (marked *e* in fig. 2 and 4) ! the latter form abutments for the action of wedges, which is thus described: "I place against the end of the spoke, flatways, a rectangular piece of plate-iron *f*, fig. 2 and 4, about the dimensions of the end *g* of the spoke, which serves to protect the latter from being bruised by the subsequent wedging, The wedges I prefer are of two kinds, the larger of good sound oak, and the smaller of wrought-iron.

The larger is of sufficient dimensions to fill up the hole or space left (as before mentioned), as at *h*, fig. 2 and 4: this is very little tapered before driving in, but sufficiently so for the foremost end to pass through the rectangular hole *i*; it is driven as far as it will go, when the part which has passed outwards at the back is cut off flush with the metallic surface of the shoe: by a proper attention to dimensions this would generally be sufficient to wedge up the spokes pretty firmly between the nave and the spoke-shoe; but the force of contact is materially increased by the addition of a sharp and narrow wrought-iron wedge, driven into the middle of the wooden wedge, as shewn at *k*, in figs. 2 and 4. By means of one or more of these wedges, according to circumstances, I produce a junction of the component parts of a wheel as solid as if it were of one body; the spokes are thereby kept well home into the nave, and by using the wood and iron wedges of appropriate sizes, I can compensate for any slight accidental difference in the length of the spokes, or thickness of

the other parts, and with great facility make the shoe-ring conform precisely to a circle described from the centre of the wheel; which is evidently an object or property of the utmost importance in a *rolling* body, especially, when it can be thus easily obtained. It is to be understood, that the wedging and other fitting of the spokes in the shoes is performed on the open side, that is to say, where the plate is removed. Every part being brought to its true bearing, the plates *a a* are fastened down into their places by the long rivets shewn at fig. 5, which passing through the holes *l l* in the plate, and corresponding holes *m m* in the shoes, are rivetted on the backs of the same (as shown by one reversed for that purpose at *z*, fig. 1), whilst the rivets are in a red-hot state; consequently by their contraction in cooling, they compress very firmly, any slight portions of the wood which might project beyond the plane of the metallic faces *n n*. The wheel is now complete except the tire. shewn at *o o*, fig. 1, which may be put on in separate streaks (or stripes) or in a single ring, and " shrunk-on" in the usual manner; that is, by heating the iron-ring so as to enlarge the circle of it sufficiently to be slipped over the circumference of the wheel, when it afterwards by cooling, shrinks, and binds the wheel with great force. This latter method I give a decided preference to. In some cases I *cast* the whole series of spoke-shoes and the shoe-ring in one entire piece.

" Having now described the *form* of the novel parts, and the *process* of combining them in a wheel upon my improved construction, of the size and kind specified, every competent wheelwright will (by taking the wheel as an example), be able to determine the due proportions to wheels of other sizes and kinds, and to construct them from the directions I have herein furnished. I limit my claim, to the invention of the before mentioned metallic boxes, which I have denominated spoke-shoes, and to the method described of keying and wedging them up; but I do not confine myself to the employment of any particular substance or material in the construction of the said spoke-shoes; nor to the precise proportions, form, or size, of those which I have delineated and described, as they may, and will necessarily, in many cases, be variously *modified* to adapt them to pecliar circumstances, without however departing from the principle or leading characterstic of my invention."

Piece Goods preparing and Finishing.—To John Frederick Smith, of Dunstan Hall, Chesterfield, a patent " for certain im-

provements in preparing or finishing piece goods, made from wool, silk, or other fibrous materials," was granted on the 12th of February, and enrolled in the same office on the 12th of August, 1830.

The piece goods to be prepared and finished according to Mr. Smith's improvements, are wound upon a cylinder within a close box while it is moistened and heated by a series of jets from a steam pipe which extends from an adjacent steam boiler to the cloth close by the cylinder. When the cloth is thus wound upon the cylinder, a piece of Russian drill of the same width is hung over the cylinder, and made to press upon it by being fixed at one end and having weights attached to the other. The cylinder is then put in rapid rotation by means of its axis which extends through the steam box: and it is said, that the centrifugal force will cause so much pressure of the cloth against the drill strap and against the several coils of itself, as to to produce a finish much superior to that which could before be produced on articles of the same quality.

METAL SURFACES TO FABRICS.—To John Yates, of Hyde, in the county of Chester, Calico Printer, a patent for "a method or process of giving a metallic surface to cotton, silk, linen, and other fabrics," was granted on the 26th of January, and the specification was enrolled in the Rolls' Chapel Office on the 24th of July, 1830.

The metal which is to be applied to the surface of the fabrics is first to be reduced to fine powder in the following manner: tin for example, is to be dissolved by a sand heat in muriatic acid of the specific gravity of 1·16, till the acid becomes saturated with the the tin. In this state the mixture is to be preserved for use in bottles well corked; and when required, pure water and this saturated solution of tin, in the proportion of ten parts of water to one of the solution, are to be put into a wooden box about five feet long, three feet wide, and one foot deep. Into this box is placed a cylinder made up of a series of rings of zinc or spelter, of about twelve inches diameter, five inches wide, and one or two inches thick. This cylinder is then made to rotate slowly with its lower edge in the mixture, by which the tin becomes attached to the surface of the zinc, from which it is to be removed by scraping. The metal is then to be repeatedly washed, continuing to change the water till it ceases to taste of the acid.

The metal is next to be placed upon cloth and dried in an oven

and then ground between two wooden surfaces and passed through a fine brass wire sieve. It is again to be put into water with a very minute quantity of muriatic acid, in order to remove any oxygen which it may have obtained in drying. After this, it it to be again washed till the water ceases to taste of acid, and then dried and sifted as before, when it is ready for application.

The cloth, paper, or leather, for the metal may be applied to either, is to be prepared by washing, bleaching, dying, glazing, &c. as the case may require. A solution of starch or glue, if leather is to be employed, is brushed over the surface, or it is applied in parts, by means of blocks, where particular patterns are to be produced. The surface being thus prepared, the powdered metal is to be applied as evenly as possible with a brush: and lastly, it is to be glazed by any of the usual processes, to give the surface the appearance of burnished metal.

REPORTS UPON AMERICAN PATENTS DATED IN JANUARY, 1830.

[From the Journal of the Franklin Institute.]

The latest number of the above-mentioned valuable periodical received here, is that for April last. It contains as usual descriptions of very numerous patents, from which we extract the following small portion, as being all that are worthy of notice. A great many of them appear to be copies of English patents already published in this and other works; the greater part of the remainder are *re-invented* trifles or absurdities. American inventors are indeed much less scrupulous than the English about patenting things of no value, living generally more secluded, they are not so well informed of the progress of mechanical improvements amongst their competitors as we are: and the cost of a patent for the whole American Union is only ONE-FIFTIETH PART (! !) of one for the British Union. It might be argued from this circumstance, that the British people had only a fiftieth part of the integrity of the American, and that in consequence the British patentee required fifty times the quantity of "protection." Some persons have considered that the reason we are made to pay so much for conferring what the state deems a *public benefit*, is, to put our patriotism to the test! However that may be, one thing is clear, the Americans cannot boast of such a magnificent "Great Seal" as ours, which costs no less a sum to make a single impression with than FORTY NINE POUNDS, TWO SHILLINGS AND TWO PENCE, sterling money of the realm* ! ! Our readers must not however suppose, that this great seal rivals in magnitude the doom of St. Paul's Cathedral, because it costs so

* See the cost of a patent, &c. p. 182, in our last volume.

much money to raise it; its real size is only eighteen inches in circumference, (to render it convenient perhaps for my Lord Chancellor's watch chain); but the lump of yellow wax it impresses is said to possess great intrinsic worth, being entirely the produce of royal bees, which is extremely rare; naturalists do however tell us, that that class of bees produce no honey whatever, although they eat a great deal. We must, however, reserve *our* investigation of this matter to a fitter opportunity, and proceed to the business before us.

For an Improvement in the Plough. James H. Conklin, *Peekskill, West Chester County, New York, January* 13.

The mould board and share of this plough are both to be of cast iron; the share is separate from the mould board, and they are to be fastened together by sockets and pins in a manner described by the patentee; the distinguishing feature of the invention is the making the share in such a form that it is precisely alike on each of its edges and sides, so that when one edge and point are worn out, it may be turned and fastened as before, "thus causing it to last twice as long as the ordinary share, without any increase in its cost."

The claim is to the share, as described, and to the mode of fastening it on.

For an Improvement in the Plough. Thomas Borden, *Portsmouth, Newport County, Rhode Island, January* 13.

"The description is as follows. The frame and beams of the plough is in a *triangular* form, with handles in the usual form; into the frame is fitted three shares composed of cast-iron, wrought-iron, or steel; the one in front attached to the beam, is a *double* share, and on each side, attached to the frame, is a single share. By passing the plough between the rows of corn, &c. the earth will be turned each way towards the rows, which will greatly facilitate the operation, and save great part of the hoeing, in the common way."

"Thomas Borden."

For a Machine for excavating earth under water, called a "Floating Excavator." Alanson Watson, *Pendleton, Niagara County, New York, January* 18.

A scow or boat is to have an opening through its centre, of about 4 feet in width, and 14 in length. A flat piece, called a scraper, is to be let down horizontally through this opening; the fore end of the scraper is to be supplied with two plough-shares, one at each corner: the scraper is to be lowered and raised when loaded, by means of two racks and pinions, and a rope and windlass. When the scraper is to operate, the boat is to be drawn forward by means of a rope attached at one end to an anchor, or other fixed object, and at the other to a windlass in the boat.

"*Invention claimed.*—What I claim as my invention, is, the before described machine, with the use of the plough-shares, racks, and pinions, and cylinder [wheel and axle] for raising and lowering the scraper."

For an Improvement in the apparatus and process to be employed for purifying, refining, and settling the salt water of the Ocean, and the brine of natural salt Springs, for the manufacture of Muriate of Soda, or common Salt, by artificial heat. SETH HUNT, *now of New York, January* 23.

THE preceding patent is taken, principally, for the application of heat to the brine while in the settling vats, cisterns, or reservoirs, for the purpose of throwing down and separating therefrom the sulphate of lime, and other earthy impurities with which it is impregnated.

For a new method of propelling Vessels in or through the water. BENJAMIN PHILLIPS, *Shipright, Philadelphia, Pennsylvania, January* 23.

THE method proposed is, to have hollow cases open at both ends, which cases are to slide from stem to stern of the vessel, at each of its sides, there being a steam engine or other power to move them. Valves, closing like shutters, which are to be hung by their upper edges, are to open as the case retreats, and close when it moves in the reverse direction. It is proposed sometimes to suspend these boxes in the manner of pendulums, which, in vibrating one way, will open, and in the other close the valves. The patentee compares these valves, in their action, to the opening and closing of venetian blinds.

The claims are to "the cases, the manner of fixing the valves within the case, the manner of connecting them to the steam engine, applying the power alternately, as one case slides aft, or propels the boat, the other case is sliding forward, its valves open, and on the return its valves shut down, and the other valves open. The cases may be either *copper, iron, wood,* or *metal.*" "I claim being the inventor of this principle of propelling or pumping vessels through the water, without causing any waves or sea, or ruffling its surface."

We do not think it necessary to reason upon the subject of the total inadequacy of the foregoing to effect the object proposed, excepting to such as are altogether uninformed respecting it, and to these we have not time to attend.

For an Improvement in the mode of evaporating Fluids, and drying Cloths, Wool, Silk, Paper, &c. without assistance from heat. JOSEPH HURD, Junr. *Boston, Massachusetts, January* 23.

THE specification commences by stating, that the "improvement

consists in giving motion to the objects from which water or moisture is to be expelled."

A large revolving frame is to be made, in form something like a reel; upon this the cloth or other article to be dried is extended, and fixed by tenter hooks, or otherwise.

"The shaft is to be put in motion by water or other power. The evaporation will increase in proportion to the velocity of the motion. When the motion is very rapid, the effect is not merely evaporation, but water is sensibly thrown out of the cloth by centrifugal force."

"It may be used with great effect for evaporating salt water for the purpose of making salt. The water may be thrown into a basin on the top of the shaft, having holes in its bottom, through which the water might pass and trickle down ropes, boards, coarse cloths, or any thing more suitable, which should be suspended and connected with the upper and lower parts of the shaft."

This apparatus is certainly well calculated to promote evaporation, and will, we think, be found applicable to many useful purposes.

For an Improvement in Taps and Dies. ARCHIBALD LAMONT, *Pittsburgh, Allegheny County, Pennsylvania, January* 29.

THE peculiarity in the taps consists, principally, in the body or solid part of the tap, within the thread, being perfectly cylindrical, whilst the whole form would be conical, were the spaces between the threads filled up. At the point of the tap the thread commences at nothing, as it is technically termed, whilst at the upper part the thread is of the full depth required. The diameter at the top, therefore, exceeds that at the bottom by double the depth of the thread. Two flutes are made on opposite sides of the tap, in order to form the cutting edges, and to allow of space to receive the cuttings.

This appears to us to be a good form for a tap, especially for a square threaded screw, such as is represented in the drawing accompanying the patent; it, however, is spoken of as applicable to such as are rounded or mitred; but the formation of these certainly would be attended with much greater difficulty.

"Of the dies. The cavity of the dies by which the screw is made forms an entire and complete circle, having two circular openings across the centre of the dies, which form the cutters, and also prevent the passing off of the chip. The screw in the dies also commences at nothing, or a plain surface, and gradually increases until the thread acquires the full size."

According to the drawings, the "two circular openings" are two flutes on each die, filed along side of the screw, to form a cutting edge.

These dies do not appear to us to promise so fairly as the taps; if a thread could be cut the whole depth at once, they would act well, but this, generally, is out of the question; only one cutting thread can be in action at once, and that the most prominent. A

complete circle, offers no small practical difficulty in cutting deep threads with dies.

For a mode of manufacturing Axes, by machinery, called the "Oval Axe Machine." Stephen Hyde, *Williamsburgh, Hampshire County, Massachusetts, January 29.*

The patent for the object above stated, is obtained for giving to the hammer and dies, which may be attached to the common trip hammer, such shapes as shall give to the iron the form which prepares it for receiving the steel, and forming the eye, so that by the use of this improvement but one person is required in making axes.

SPECIFICATION OF A NEW PROCESS FOR MAKING SHEAR STEEL.

Patented September 4, 1828, by Mr. Charles Sanderson, of Park Gate Iron Works, near Rotherham.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said Charles Sanderson, do hereby declare, the nature of my said invention, to consist, in forming shear steel out of very small pieces of bar steel, instead of pieces from one to two feet in length, as heretofore, whereby I am enabled to form shear steel with fewer heats, and, consequently, with less waste, and without the use of silicious sand, as heretofore practised. And in further compliance with the said proviso, I, the said Charles Sanderson, do hereby describe the manner in which my said invention is to be performed, by the following description thereof, (that is to say) :—

I take bar steel in the state in which it comes from the converting furnace, and break it into very small pieces of one inch to two inches long; a quantity of these small pieces being ready, I procure a round stone, of any quality which is capable of withstanding the strong heat of a reverberatory furnace, without cracking or breaking, and upon this stone the small pieces of steel are piled as closely and compactly as possible; the whole is then inclosed in a fire clay crucible, and placed in a reverberatory furnace, where it is allowed to remain until the whole mass becomes of a high welding heat; it is then taken from the crucible and placed under a heavy cast iron hammer, usually called a metal helve, and exactly the same as those used in the manufacture of bar iron; this hammer is driven by machinery, and from the circumstance of the whole mass being in a semi-fluid state, it is almost instantaneously hammered or manufactured into one solid mass or bloom of steel, of from three to four inches square; this bloom is placed in a furnace, or as it is more generally termed, a hollow fire, of two or three feet square, heated with coke, and the heat increased by the application of a blast of

air, and the whole mass or body of the steel so hammered or manufactured as aforesaid, is raised to a high welding heat; it is then taken from the furnace and placed under the same metal helve or hammer before mentioned, and drawn into a bar of shear steel, ready to be tilted or rolled into the various sizes or shapes which may be required. For shear steel to be used for inferior purposes, it might be too expensive to place the piled steel in a crucible, but it might merely be placed in a reverberatory furnace, and drawn thence when it is of a complete welding heat. Shear steel made in this manner being very superior in quality to that made in the ordinary way, and the process herein described causing much less waste than that heretofore adopted, I hereby claim as my invention, the said process or method of manufacturing shear steel; and such my invention, being to the best of my knowledge and belief, entirely new and never before used within that part of his said Majesty's United Kingdom of Great Britain and Ireland, called England, his said dominion of Wales or Town of Berwick upon Tweed. I do hereby declare this to be my specification of the same, and that I do verily believe this my said specification doth comply in all respects fully and without reserve or disguise with the proviso in the said hereinbefore in part recited letters patent contained; wherefore I hereby claim to maintain exclusive right and privilege to my said invention.

In witness whereof, &c.

IMPROVED MILLS.

It appears from the annexed specification, and remarks subjoined by Dr. Thomas P. Jones, that an entirely new mechanical arrangement of great efficacy has been contrived in America, as a grinding surface for mills generally.

To all to whom it may concern, be it known, that I, Barton N. Fyler, of Bradford, Orange county, in the state of Vermont, have invented a new and useful apparatus for the purpose of grinding or rubbing down whet stones, marble, and other stones, and hard substances, and which I also mean to apply to the grinding of grain and of other articles which are to be reduced to powder, and also to the clearing or hulling of seeds of various kinds, and also to the grinding to pulp of rags, and other articles used in the manufacture of paper, and I do hereby declare that the following is a true and exact description of my said apparatus.

I make, of any suitable kind of wood, a wheel, or cylinder, which may be in the form of the ordinary mill stone, or of a grind stone, with the end of the grain of the wood forming the surface upon which the grinding is to be effected. When the flat surface or ends of the cylinder are to be used as in the mill stone, the grain of the wood is placed in the direction of the axis of the cylinder. When the periphery is to be employed as in common grind stones, the grain is

made to run from the axis towards the periphery, by joining together a number of wedge formed pieces of timber.

I then take pieces of iron, or steel, or of any other metal, generally using pieces of rolled iron about one-eight of an inch in thickness, about one inch wide, and four inches in length, more or less; these I drive endwise into the end grain of the wood, and even with its surface, allowing a space between them, generally, of one-fourth of an inch, placing or driving them in this manner over the whole surface.

When stone, or other hard substances, are to be ground or rubbed down, I use sharp sand, emery, or other similar article, either with or without water, the hollows or flutes which form in the wood between the strips of of metal serving to retain the sand, or other coarse powder, and to cause it to operate with great efficiency. When I use my combined grinder as a substitute for a mill stone in the grinding of grain, and for other purposes, I give such a form and direction to the pieces of metal as may be thought best to answer the purpose of the ordinary dressing upon such stones; their distance also being varied as judgment or fancy may direct.

The combined grinder is readily dressed or sharpened when used as a mill stone, by running between the surfaces, fine sand, which speedily gives a cutting edge to the metallic strips.

For the grinding or facing of large slabs of marble, I use a wheel of about three feet diameter, with its under flat side formed for the grinding surface; this I attach to the lower end of a perpendicular shaft, which is confined in suitable gudgeon blocks; a swivel joint is connected at the upper end of the shaft, by means of which it is raised and lowered at pleasure, and is put in a revolving motion by any suitable machinery.

Sand and water are applied through apertures at, or near, the centre of the wheel. The marble, or other article to be ground, is carried under the rubber in a level position by a crane of about twelve feet sweep.

The various kinds and forms of marble rubbers now in use, may be constructed on the principle of my combined grinder, and applied in the same manner they have heretofore been used.

What I claim as new, and as my invention, and for which I ask an exclusive privilege, is the formation of a grinding surface, by the combination of wood and of metal; the metal being driven or inserted into the end grain of the wood, in the manner and upon the principle hereinbefore described, whether the metal be in the form of strips, or of pins, or in any other shape, and to whatever kind of grinding, a surface so formed may be applied.

Barton N. Flyer.

At fig. 1, Plate VIII. is represented the form in which the strips of iron are driven, as shown in the model deposited in the patent office, but which may be varied as may best suit the indended use.

Remarks by the Editor.—The patentee and his brothers have been

long engaged in the manufacture of what are called the "Magog oil stones," and the "Indian pond scythe stones;" the process of grinding them down, formerly pursued, consisted in holding them upon the flat side of a mill stone of about 3½ feet in diameter, made from granite rock, and supplied with water and sand. Mr. Flyer at length thought of the kind of grinder above described, and upon trying it, was agreeably surprised in finding it to operate in a manner so advantageous as greatly to transcend his expectations: he was, in fact, astonished at the success of his own machine.

Encouraged by this success, he was induced to employ a grinder in the rubbing down of marble, and afterwards as a substitute for burr mill stones, in the grinding of grain, and, as he states, with perfect success: his testimony being fully corroborated by others. Many experiments have been instituted, and are in progress, in order to ascertain the best draught of furrows, and the most proper forms, distances, or positions, of the plates or pins. This grinder promises to form one of the best, and most economical, hand corn mills; a machine so much needed in many parts of our country.

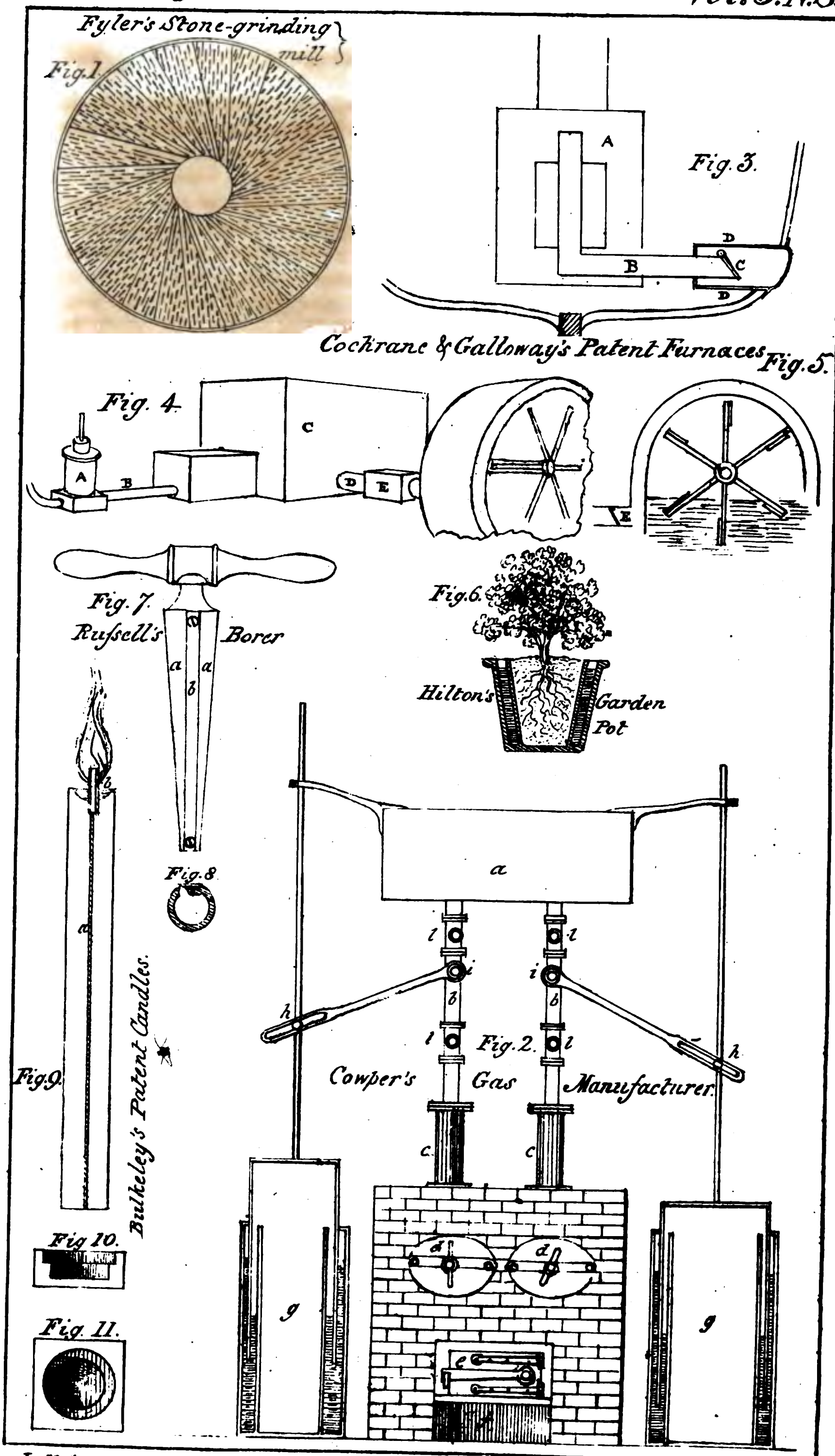
There is another important application of this apparatus, in the art of grinding, which will probably become the subject of another patent. Upon this point we shall merely observe, that we have received a specimen of the work performed by it, in an experimental essay, and that this specimen is remarkably good; we hope, therefore, to make known this new application at an early day.—*Franklin Journal.*

SPECIFICATION OF THE PATENT GRANTED TO MESSRS. COCHRANE AND GALLOWAY, FOR THEIR IMPROVED AIR-TIGHT FURNACES.

(**Concluded from p. 79, in our last Number.**)

This part of the specification relates to the application of the invention to steam boats, and although the subject of it in the original form it was patented, and now appears, may be regarded as a failure, it is one which must interest every mechanic; since it was probably owing to the unhappy perseverance in this *unpromising* scheme, that the emancipation of the wretched Greeks from the thraldrom of their Turkish masters was considerably procrastinated, and all the horrors attending their sanguinary and devastating warfare continued for a much longer period.

"Fig. 3, Plate VIII. shows a view of a boiler, flues, &c., similar to the boiler, flues, &c. shown in fig. 1, but fitted to a ship or vessel, and from which the smoke, gas, and heated air, are permitted to escape for dissipation through the side of such ship or vessel into the water, at such a depth from the surface as may be necessary. The smoke pipe or horizontal chimney B, leading from the boiler A, contains the valve C, which opens by the pressure of the smoke, and is shut by that of the water. The pipe or chimney B is surrounded, and the valve C guarded by the metal case or pipe D D,



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which connects to the boiler, and is made water-tight, and of such dimensions as shall contain a sufficient quantity of water to keep the case or pipe D D so cool as not to injure the timber of the vessel with which it comes immediately in contact. The pressure on the valve C is regulated by its area, and the height of the external column of water bearing on the valve, and according to which pressure must be the force of the compressed atmospheric air, necessary to feed the fire in which the smoke is generated.

Fig. 4. will illustrate not only the third part of our invention, namely, that of applying the smoke and gases issuing from one of our air-tight fire-places, but it will also exhibit the two first parts of it, by forming a combined view of the whole, besides showing many combinations which are no part of our invention, but which are common and necessary to give them effect: and showing the operation of each as applied to the working of steam boilers on board ship, and the application of such smoke and gases resulting from the use of such air-tight fire-places, to assist the steam engine machinery, employed for the propelling of any such vessel through the water. Fig. 4. represents a perspective view of a blowing pump, a steam engine boiler with air-tight fireplaces and apparatus to be placed on board ship, with a paddle-wheel to be worked either in the interior or exterior of a vessel, and an air-tight reservoir or case for enclosing that part of the paddle-wheel. The principal object of this fig. 4, is not to lay claim to those parts on combinations of machines, except what has been explained, or is to be explained, as our invention, but to afford the means of describing that part of our invention more effectually, which relates to the mode of applying the smoke and gases generated in our improved air-tight stoves, furnaces, and fire-places to certain useful purposes, which are to assist the propelling of a vessel by such smoke and gases, by forcing down the water that will rise in such paddle-wheel, reservoir, or case, according to the ship's draught of water, low enough to relieve such paddle-wheel from the obstruction of such a body of water, and which desirable object of propelling a vessel by internal paddles has been to a small extent accomplished, by means of pumping directly into the paddle reservoirs atmospheric air to force and keep down the water; but the great labour of supplying such reservoirs with air, owing to the great dissipation of such air, by the rotation of the paddle-wheels in the direction of their motions, have hitherto among other causes, rendered that project unsuccessful, but which our invention is intended to obviate and remove. The great and easy supply of smoke and gases, issuing from our air-tight stoves, furnaces, or fire-places, when properly connected with these paddle reservoirs, will be sufficient not only to force and keep down any body of water, that may by any pressure be invited into such paddle-wheel, reservoir, or case, or the well or opening in the bottom of such vessel, but will amply provide for any loss, or dissipation of the smoke or gases that may necessarily or unnecessarily take place by the rotation of any paddle-wheel in its motion through the water, besides supplying the loss and dissipation that may be created

by the passage and motion of the vessel through the water. It is obvious that the atmospheric air, pumped, forced, or conveyed into a fire-place, to keep on and promote the ignition of any fuel will become rarefied, and thereby considerably increased in its bulk, together with the smoke and gases generated by the combustion of any fuel, will form a considerable column and supply of gases to be used for forcing and keeping down the water in such paddle-wheel, reservoir, or case, with a small degree of power or labour, compared to what would be necessary to feed such reservoir or case, with an adequate supply of ordinary atmospheric air. Fig. 4, A, represents a blowing pump: B, the pipe through which the air is forced into the fire-place: C, the boiler which contains the air-tight fire-place and apparatus: D the pipe; and E the valve, through which the smoke and gases are conveyed into the paddle-wheel, reservoir, or cases, when such smoke and gases shall be so compressed as to be able to lift the valve E, and the pressure of the water upon it. While the smoke and gases are thus usefully applied, any superabundant quantity generated in the air-tight fire-place will be deposited and dispersed in the water after they have performed their duty or useful purposes in the paddle-wheel, reservoir, or case, without the inconvenience or annoyance occasioned by the issue of foul smoke as from common chimneys.

Fig. 5 is a section of a paddle-wheel with its reservoir or case, and a tunnel which may either extend round the reservoir or case, or may be placed in the interior of the reservoir, near the extremity, and extending from side to side: this tunnel will be found to be a very convenient assistant to enable the smoke and gases to keep down the back water, and give a free communication to the smoke and gases from side to side of the paddle case. The abstract parts, or the combinations of machinery, by which we construct our air-tight stoves, furnaces, or fire-places, we do not claim, but as they are necessary as means to effect the object of our invention: these objects may also be effected and produced by other abstract parts and combinations of machinery, not explained or described either in this specification, or in the drawings annexed; but yet such alterations may be made embracing the priciples of our invention that may be a different modification of them, and yet be substantially in their effects and principles our invention; which is for the working or making a manufacture, being a machine or machines for removing the inconvenience of smoke or gases generated in stoves, furnaces, or fire-places, by the ignition or combustion of coals or other inflammable substances; and in certain cases for directing the heat, and applying such smoke or gases to various useful purposes. In witness whereof, I, the said Alexander Galloway, have hereunto set my hand and seal, this fourth day of November, in the year of our Lord, one thousand eight hundred and eighteen.

It is proper we should state, that we did not think it necessary to copy the entire *drawings* which accompany the foregoing specifi-

tion, conceiving the *sketches* we have given to be sufficiently explanatory, but any of our readers may *see* the originals at the Rolls Chapel Office, Chancery Lane, by paying the extortionate fee of three shillings and sixpence.*

On the day that our last number was published the Lord Chancellor gave his decision in this case (Galloway versus Braithwaite), in nearly the following words:—

"I do not find that Mr. Galloway carries back the use of his boiler above six months. Previously to that time it appears he was, to a certain degree, making experiments. Now the patent of Mr. Braithwaite is one year and a half old, and it is dated in January, 1829; so that this boiler which Mr. Galloway is now showing was, in point of fact, not in use till one year after Mr. Braithwaite's patent was obtained. Under these circumstances, I think the parties ought to be left to try their right at law. It is quite unnecessary for me, in this state of things, to give any opinion with respect to the patent; but this much, however, I will state, I have read the specification with attention, and the evidence, and it appears to me that the objects of the two patents are different; and that the principle of the two patents, as far as relates to the object, appears to me to be different. It is said, and said with some truth, that if Mr. Galloway was the inventor of a machine which he applies to one purpose, another person cannot make use of that machine for another purpose; but then Mr. Galloway claims, according to the phraseology, abstract parts of this machine, and the combination of the machine only with respect to the objects to which it is directed; that object appears to me to be very different to the object to which Mr. Braithwaite's is directed; on that part of the case it is unnecessary for me to express my opinion. * * * * * Under the circumstances I shall not grant the injunction."

Mr. Galloway has since expressed his intention to proceed by action at law against the defendants, Messrs. Braithwaite and Erricson. We are sorry for this, as we have no desire that the lawyers should be enriched at his expense; being fully persuaded that in his case, he will not even get one of the shells of the oyster for his portion.

For giving our opinion unreservedly on this subject in our last number, we have been most violently attacked by two anonymous correspondents, "Justicia" and "A Friend to Merit." If these gentlemen will condescend to favour us with their real names, to be put to their effusions, we will give them insertion verbatim in our next number, and without a word of comment, as we think *they answer themselves* much better than we could answer them; and with

* We mention this, as many of our readers are perhaps not aware how much the information we furnish them monthly costs us in money and labour; the money charges, though heavy, are however the least part of the infliction. Let them imagine a single specification, from ten to twenty yards long, (and there are many such) and consider the numberless pinches of snuff, and consequent sneezings, that are necessary to keep us awake and get through our labour.

much more truth than the "potatoes" of Sir R. Birnie, (which he said) "spoke for themselves." There is besides a respectable writer in the Mechanics' Magazine, who under the signature F, is very fond of correcting there what he deems to be our errors and mistatements. Now, we ask him, would it not be better to furnish the antidote to those who have imbibed the poison? Or does he thinks the readers of the REGISTER are too keen not to see through what we consider his sophisms? We are sure there is not one of them who knows that we never charged one of the numerous witnesses in this case, (of Galloway and Braithwaite) with perjury, that on the contrary, we explained how the contradictory evidence arose. Anything that "F" has to say to our readers in defence of the inventions of his friends, or in correction of our remarks, we shall with pleasure insert in this work.

NATIONAL REPOSITORY,

CHARING CROSS.

AMONGST the articles recently introduced into the above establishment we observed the following :—

HILTON'S GARDEN POT.—This pot is of the ordinary red earthen kind, but is made double (or with an external case), as represented in the drawing, fig. 6, Pl. VIII. the water for supplying the p ant is put in the annular cavity between the external and the internal vessel; the latter from its porosity absorbs and conducts the water to the roots of the plant, where it is more uniformly and gradually diffused than by the usual method of supplying the water, either at the top or bottom of the pot, where the plant instead of being moistened, is flooded. We have not heard what are the inventor's views in this alteration; but we fear it will be attended with the liability of the pores through which the water passes becoming choked up, like common filtering stones. If this objection can be obviated, (presuming it exists) the advantage to plants thus supplied with water divested of most of its impurities may be found very great. (The inventor is Mr. Hilton, Wine Merchant, of Regent Street.)

RUSSELL'S BORING TOOL.—This is an excellent contrivance for boring clean circular holes in casks and similar vessels. It is formed of a conical tube *a a*, with a long steel plate *b* (see fig. 7, Pl. VIII.) having an edge like a "plane-iron" screwed down upon it, the edge projecting in the direction of a tangent to the circle, so as to cut as the instrument is turned round, the shavings passing through the slit into the interior; in this receptacle they may all be collected, without any falling into the wine or other liquor, by putting a cork temporarily into the aperture at the small end of the instrument. At fig. 8 a section is given of the instrument; its utility and convenience need no further remark.

FRYER'S WASHING MACHINE.

In giving insertion to the following communication from the inventor of the machines as under, we think it but just to state, that they appear from numerous respectable certificates to have been found practically advantageous in the saving of labour and expense. Their construction is judicious, being simple and strong. They are put in action by the continuous rotary movement of a winch, which produces through the medium of a pinion and wheel, with a crank on the axis of the latter, a vibratory action upon a wooden presser, contained in a box, (where the linen and water are put) which causes a constant forcing of the water backwards and forwards through the interstices of the linen. The subjoined wood cuts, together with the annexed letter, will, we trust, be sufficiently explanatory.

Fig. 1.

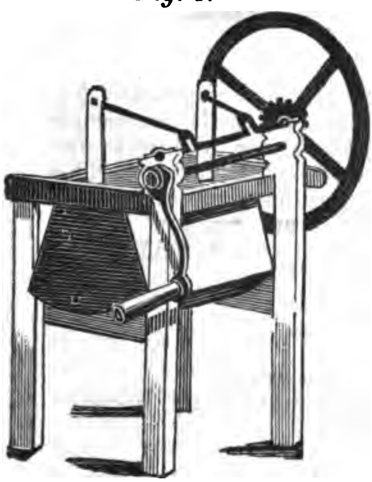
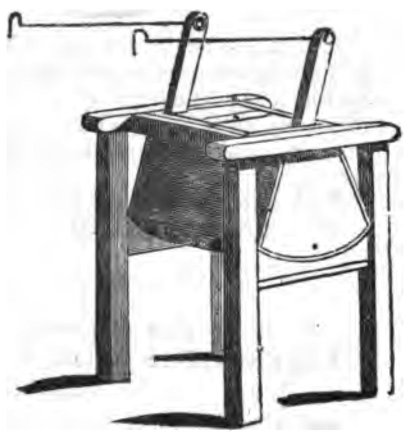


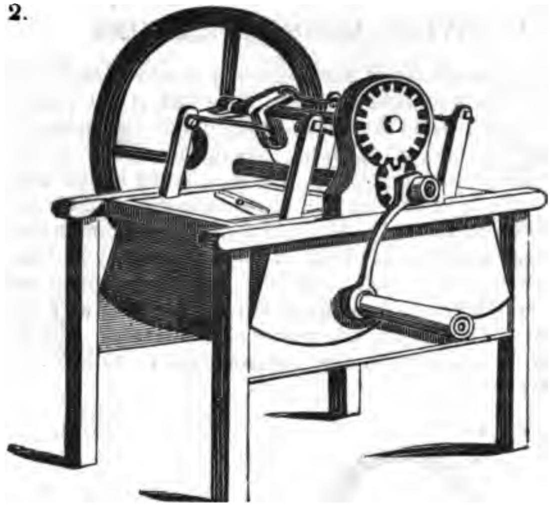
Fig. 3.



TO THE EDITOR.

Sir,—As you intimated in your account of the National Repository (vol. ii. No. 39) your intention of describing at some future opportunity, my washing machine, then in the exhibition, I have thought it advisable (now that its merits have been amply attested and approved of by the public) to send you a more extended view of them. It will be easily perceived by your enlightened readers, from the drawings, that these machines are capable of great variety as to size or number to be worked together; so as to suit large or small establishments, as well as their being adapted to work by steam, wind, or water, &c.

Fig. 2.



No. 1 is a single machine : No. 2 is a double machine : No. 3 is a machine made to attach to another, and shews the principle by which any number may be worked together. The treble machines are made by dividing one of the sides of the double machine into two smaller compartments by a partition across the middle, &c. I am, Sir, &c.

No 1, Brown's Lane, Spital Square. R. FRYER.
3rd August, 1830.

EXTRAORDINARY AND IMPORTANT

EXPERIMENTS WITH CANAL BOATS AT HIGH VELOCITIES.

We extract from the "Edinburgh Advertiser" the annexed account of some experiments, which prove (what we have always thought) that high velocities are attainable by properly constructed vessels, upon canals, or narrow waters, without raising a great wave, and consequently injuring the banks. With this view we constructed about a year ago, the model of a boat, representing 150 feet in length, 10 feet beam, and about 5 feet deep, (to be raised upon as occasion might require). It has no keel except at the bows and stern for the convenience of dividing the water and steering; it is nearly flat-bottomed, and the form of the bows precisely upon the model of the small end of the bowl of a spoon; except, as respect a very sharp keel in that part, as before mentioned.

The object was of course to distribute the load over as large a

surface of water, and sink as little in it as possible; and by obtaining the greatest practicable velocity to lessen in proportion the draught of water.

At the period of constructing this model (1 inch to the foot, which we have by us now), we also proposed to make another of nearly the same form, but in two parts: this will best be understood by supposing the boat single and entire (as the first mentioned), which being then cut longitudinally and vertically into two equal parts, the two closed sides are to be brought together, nearly or quite in contact, and the now two open sides to be closed nearly perpendicularly and in a straight line, so as to meet at each half bow in a point. By this arrangement it was hoped that no wave would be produced on the outside of the boat, and merely a ripple in the interior, between the two halves of the boat, which ripple it was thought, would be *reduced* in proportion to the velocity, instead of increased, according to the prevailing notion. These ideas were deemed exceedingly wild and unscientific by many of our friends, and we have often regretted that other calls upon our time prevented our ascertaining, by experiment, their real merits. We are, however, exceedingly gratified to learn that similar views of the subject have been entertained by our northern brethren, and that they have been practically put to the test, on the large scale; and most likely far more judiciously than we had even conceived.

"We regard the experiments described below as extremely important. If the result is correctly stated, and if no counteracting disadvantage has escaped notice, we think these experiment may be said to have added a million sterling to the value of canal property in Great Britain, since they must at no distant period, add fifty or a hundred thousand pounds to the annual dividends. Nothing can be more paradoxical or startling in appearance than this result; and yet our knowledge of the many unexpected truths in mechanical science which experiment has brought to light, will not permit us to reject it as incredible. It is this; *that the surge generated in a canal by the motion of a boat, and which is so destructive to the banks, in moderately rapid motion* (such as 4 or 5 miles an hour) *ceases altogether when a high velocity is employed.* It it true the vessels were of a particular construction, but this is immaterial. A boat 60 feet long and 5 feet wide is capable of being extremely serviceable, both for the conveyance of goods and passengers; and if such a boat can be safely and conveniently dragged at the rate of 9 or 10 miles an hour upon our canals, passengers by this species of conveyance will be upon a level as to speed with those who travel per mail. The great recommendations of canal carriage at present are its cheapness, and the liberty of locomotion which passengers enjoy. Its leading disadvantage is its slowness; and this is felt now more and more, when our stage-coaches are touching a speed of ten miles an hour, which will soon be doubled on our railways. We have not technical skill

enough to know what a gig-boat is; but we infer from the other particulars stated, that it must be flat-bottomed in the cross section, pretty well curved upwards at stem and stern, and very light. With this form, the quicker it is moved, the less water it will draw. At a very high velocity, it will merely skim the surface as it were; the displacement of the fluid will reach only a few inches down; and this circumstance, with the quick motion of the boat, causing a re-adjustment of the equilibrium of the water equally rapid, the necessary time will be wanting for the motion to propagate itself beyond the narrow zone of water which immediately encompasses the boat. Such is our hypothesis, supposing the fact to be as stated. We have a strong impression, however, that the result depends chiefly on the form of the boat, and that a much greater breadth than five feet will be no material disadvantage, except where the canal is extremely narrow."

"Some months ago, by the suggestion of Mr. William Houston, of Johnstone, the Committee of Management of the Ardrossan and Paisley Canal, where induced to make certain experiments for ascertaining the rate of velocity at which a light gig-boat might be propelled along that canal. The experiments were made with a gig-rowing boat of about 30 feet in length, constructed by Mr. Hunter, boat-builder, Brown Street, Glasgow; and this boat, with 10 men on board, was drawn two miles along the Ardrossan or Paisley Canal, in the space of less than 10 minutes, without raising any surge or commotion on the water—the force employed being one horse, rode by a canal driver. No account of this trial has ever been given to the public, but it was so satisfactory as to induce the Committee of the Ardrossan Canal to contract with Mr. Wood, of Port Glasgow, for a gig-shaped passage boat, 60 feet in length, and 5 feet in breadth, fitted to carry from 36 to 40 passengers. In the month of April last, a number of experiments were made in the Forth and Clyde Canal with two gig-boats fixed together, constructed by Mr. Hunter, and thus forming what is called a twin-boat. The object of these trials was to ascertain the rate of speed at which vessels might be propelled along that canal, and the effect of a light double or twin-boat, in giving that degree of steadiness which it was apprehended would be so much wanting in a light single boat. A statement of these experiments on the Forth and Clyde Canal has already appeared in the newspapers, and the only fact therein mentioned, which it seems necessary to repeat here, is the remarkable circumstance, that the quicker the boats were propelled through the water, the less appearance there was of surge or wave on the sides of the canal. The result of the experiments was so satisfactory, that a twin-boat of a gig shape, 60 feet in length, and 9 feet broad, is at present building by Mr. Hunter, Brown Street, Glasgow, and will be launched in the Forth and Clyde Canal in the course of the present month."

"The single gig-shaped passage-boat contracted for by the

Ardrossan Canal Committee, was launched at Port Glasgow on Wednesday se'en-night, the 2nd of June, and she was towed up to the Broomilaw, and thence carried to Port Eglinton the day following; and on Friday, the 4th of June, a trial, of which the following is an account, took place. The boat is 60 feet long, 4 feet 6 inches breadth of beam, and drew on an average, including a deep keel, 10 inches when light:—

"From the great hurry in which this trial was made, it was done under many disadvantages. The boat started from Port Eglinton for Paisley a few minutes after one o'clock, with 20 persons on board, and the distance from Port Eglinton to Paisley being 7 miles, was accomplished in 1 hour and 7 minutes. The rider was ordered to start and proceed the first mile or so at a very moderate pace, but even at this moderate pace the wave raised in front of the boat was very considerable. A high wave was seen on the canal preceding the boat, about 80 or 90 feet in front, and in some cases farther, and causing an overflow at the bridges, and in the narrow parts of the canal. The surge or cutting wave behind the boat was, however, comparatively slight, and except at the curves, would not have caused much injury to the canal-banks. The horse was very much exhausted when he got to Paisley, though by no means so exhausted as he was about the middle of the journey, having sensibly recovered after the first four or five miles.

"Two post horses were hired there; and lighter towing lines being attached to the boat, it started again, on its return to Glasgow, with 24 persons on board, 4 of whom were boys, and arrived at Glasgow, a distance of 7 miles, in 45 minutes. The greatest speed attained during the journey was 2 miles in 11 minutes. During this voyage the surge behind was entirely got quit of, even at the curves, where it was reduced to nothing; and there was no front wave, except at the bridges. It appeared only at the bridges, and just as the boat was about to enter under the bridge, and gradually disapeared as the stern of the boat cleared the bridge. *The quicker the boat went, the more entire was the disappearance of all wave aud surge*, except where the water escaped in the centre of the canal, and met in two very noisy and rapid currents from each side of the boat at the rudder. This noise and rush of water was so great behind as to induce persons on board to look round expecting to see a great wave or surge on the banks of the canal, but on the banks there was hardly a ripple. The two rapid, noisy currents seemed to be completely spent and exhausted by the shock of their concourse behind the boat. Here, therefore, there was no room to doubt of the correctness of the reports of the Forth and Clyde Canal experiments. It was not merely to be said that the greater the speed the less surge or wave, but it was demonstrated that *at a high rate of speed, surge and wave were done away with altogether*. Unluckily, there was no dyanometer attached to the rope, so as to ascertain whether, contrary to all theory, the

strain or pull was not equally with the wave, and the tugging labour of the two horses lessened instead of increased, by the accelerated rate at which they drew the boat. There can be no doubt however, that with one trained horse, properly attached, the distance could be done in a period under 40 minutes. Contrary to expectation, Mr. Wood's boat was quite steady in the water, and by no means crank. It may be proper to mention that the Ardrossan Canal is throughout very narrow; at the bridges and many other places it is only 9 feet broad. It has a great number of turns, and many of them very sudden."

MISCELLANEOUS.

Notice of Chrome Orange.—In Brande's Quarterly Journal, from October to December, 1829, Mr. Graham remarks, "It is singular, that, although no other colour has been so much run upon for a couple of years in cotton yarn, no account of the mode of raising this beautiful tint, so far as I can learn, has hitherto been published; yet this process is universally known, and followed by dyers. The first object is, to procure upon the yarns a good body of chrome yellow, of the ordinary and familiar tint of chromate of lead. For this purpose, the goods are well charged with protoxide of lead, which is done by dipping them in a solution of acetate of lead, and then decomposing the salt by lime water, of which the lime takes the acetic acid, and leaves the oxide of lead in the cloth. Every trace of lime must then be got rid of by washing.

It is necessary to have nothing but oxide of lead on the cloth; for, with acetate or nitrate of lead, as the mordant, the colour will be uneven. The goods are then passed through a bath of bi-chromate of potassa, which instantly strikes the chrome yellow with the oxide of lead.

The orange is raised by throwing the goods so prepared into lime water, at, or near, a boiling heat. Lime, at that temperature, appears to be capable of partially decomposing the chromate of lead, taking half the chromic acid from a greater or less portion of that salt, and reducing it to the state of di-chromate of lead. The di-chromate of lead is itself of a full red colour."

Seeing in the Water.—Land animals always see imperfectly in the water, and aquatic animals imperfectly in air. The one is long-sighted in water, and the other short-sighted in air. In those cases where the habit of the animal require it, to see in both *media*, it is provided with two sets of eyes, or with eyes accommodated for seeing in each element. Thus the Gyrinus natator, an insect which generally swims on the surface of water, but half submerged, is provided on each side with two sets of eyes; one pair situated on the crown of the head, for seeing in the air; and another pair under the head, for seeing in the water.

Extent of the Iron Trade of Great Britain.

In the year 1740, the whole iron made in Great Britain was 17,000 tons, from 59 furnaces.
In 1788, it had increased to 68,000 tons, from 121 furnaces.
In 1796, it had increased to 125,000.
In 1806, it had increased to 250,000.
In 1820, it had increased to 400,000.
In 1827, it had increased to 690,000 tons, from 284 furnaces.

The different counties in which it is made are as under in 1827.

Staffordshire, . . .	216,000 tons,	from 95 furnaces.
Shropshire, . . .	78,000 tons,	from 31 furnaces.
South Wales, . . .	272,000 tons,	from 90 furnaces.
North Wales, . . .	24,000 tons,	from 12 furnaces.
Yorkshire, . . .	43,000 tons,	from 24 furnaces,
Derbyshire, . . .	20,500 tons,	from 14 furnaces.
Scotland, . . .	36,500 tons,	from 18 furnaces.
	690,000 tons.	284 furnaces.

About three-tenths of this quantity are of a quality suitable for the foundry, which is all used in Great Britain and Ireland, with the exception of a small quantity exported to France and America. The other seven-tenths are made into bars, rods, sheets, &c. of which a large quantity is exported to all parts of the world.—*Repertory of Arts, Oct.* 1828.

LIST OF NEW PATENTS SEALED.

FERMENTATION.—To E. Riley, of Skinner Street, Bishopsgate Street, for certain improvements in the process and apparatus for fermenting malt and other liquors.—Dated 19th July, 1830.—Specification to be enrolled in Six months.

SHEARING.—To G. Oldland, of Hillsley, Gloucestershire, for his certain improvements in the machinery or apparatus for shearing and dressing woollen cloths and other fabrics.—22nd July, 1830.—Six months.

POWER.—To J. Ericcson, of the New Road, for an improved engine for communicating power for mechanical purposes.—Six months.

SUGAR.—To A. Garnett, of Demerara, Esq. for certain improvements in manufacturing sugar.—24th July, 1830.—Six months.

PLATING.—To S. Roberts, of Park Grange, near Sheffield, Yorkshire, for certain improvements in plating or coating of copper or brass, as also a method of making such kinds of articles or utensils with the said metal, when so plated.—26th July, 1830.—Two months.

PAPER.—To R. Ibotson, of Poyle, Middlesex, for an improvement or improvements in the method or apparatus for separating the knots for paper stuff or pulp, used in the manufacture of paper.—29th July, 1830.—Four months.

PROPELLING MACHINERY.—To J. Ruthven, of Edinburgh, for an improved machinery for the navigating of vessels and propelling of carriages.—5th August, 1830.—Six months.

GAS.—To J. Down, of Leicester, for certain improvements in making gas for illumination, and in the apparatus for the same.—5th August, 1830.—Six months.

ROTARY MOTION.—To J. Street, of Clifton, Gloucestershire, for a new mode of obtaining a rotary motion by water, steam, or gas, or other va-

pour; being applicable to the giving blasts to furnaces, forges, and other purposes where a constant blast is required.—5th August, 1830.—Two months.

SAFETY BOAT.—To W. Dobree, of Fulham, for an independent safety boat of novel construction.—5th August, 1830.—Six months.

ROVING FRAMES.—To W. Lane, of Stockport, Chester, for certain improvements in machines, which are commonly known among cotton spinners by the names of roving frames, or otherwise called cove frames, or bobbin and fly frames, or jack frames.—5th August, 1830.—Four months,

WEARING APPAREL.—To T. Hancock, of Goswell Road, for improvements in the manufacture of certain articles of dress or wearing apparel, fancy ornaments, or figures.—5th August, 1830.—Two months.

WHEEL BARROWS.—To W. Mallet, of Marlborough Street. Dublin, for certain improvements in making or constructing certain description of wheel barrows.—5th August, 1830.—Six months.

WHEELS.—To J. Pearse, of Tavistock, Devon, for an improved method of making and constructing carriage wheels, and in the application thereof to carriages.—5th August, 1830.—Six months.

RICE.—To C. Shiels, of Liverpool, for certain improvements in the process of preparing and cleansing rice. Communicated by a Foreigner.—5th August, 1830.—Six months.

BREWING, &c.—To Æ. Coffey, of the Dock Distillery, Dublin, for certain improvements in the apparatus or machinery used in the process of brewing and distilling.—5th August, 1830.—Six months.

SUGAR.—To M. Robinson, of Great George Street, Westminster, for certain improvements in the process of making and purifying sugars. Communicated by a Foreigner.—5th August, 1830.—Six months.

BLOCK MAKING.—To R. Clough, of Liverpool, for an improved supporting block, to be used in graving docks, and for other purposes.—5th August, 1830.—Six months.

PACKING.—To Sir C. Webb Dance, of Hertsbourne, for certain improvements in packing and transporting goods—5th August, 1830.—Six months.

TOUCH HOLES.—To S. Smith, of Princes Street, Leicester Fields, for a new nipple or touch hole, to be applied to fire arms for the purpose of firing the same by percussion; and a new cap or primer for containing the priming, by which such fire arms are to be fired.—7th August, 1830.—Two months.

CANDLES.—To W. Palmer, of Wilson Street, Finsbury Square, for improvements in making candles.—10th August, 1830.—Six months.

SADDLES.—To J. Lawrence, of Birmingham, and W. Rudder, of Edge, Gloucestershire, for an improvement in saddles and girths by an apparatus affixed to either of them.—10th August, 1830.—Six months.

MEDICINE.—To T. Ford, of Canonbury Square, Islington, for certain improvements in the medicine for the cure of coughs, colds, asthmas, and consumptions, known by the name of "Ford's Balsam of Horehound.—12th August, 1830.—Two months.

HOP POLE MACHINE.—To J. Knowles, of Farnham, Surrey, for a certain instrument or machine for drawing up hop poles out of the ground, previous to picking the hops; and which, by drawing the poles perpendicularly, will greatly save them, as well as prevent the hops from being bruised, called "a hop pole drawer by lever and fulcrum."—Two months.

PAPER.—To M. Towgood, of Dartford, Kent, and L. Smith, of Paternoster Row, London, for an improved mode of applying size to paper.—18th August, 1830.—Six months.

PROPELLING MACHINERY.—To Major General Gubbins, of Southampton, for certain improvements in propelling and giving motion to machinery.—18th August, 1830.—Six months.

BRICK MAKING.—To S. R. Bakewell, of Whiskin Street, Clerkenwell, for certain improvements in machinery, apparatus, or implements to be used in the manufacture of bricks, tiles, and other articles to be formed or made of clay, or other plastic materials. Partly communicated by a Foreigner.—18th August, 1830.—Six months.

PATENTS ENROLLED BETWEEN 20TH AUGUST AND 20TH SEPTEMBER, 1830.

Particularizing the Offices in which the Specifications may be inspected, with the Dates of Enrolment.

Cocks.—To E. W. Rudder and R. Martineau, of Birmingham, cock-founders, a patent for "certain improvements in cocks for draining off liquids," was granted on the 27th of February, and the specification was lodged in the Enrolment Office on the 20th of August, 1830.

The plan proposed to be adopted by these patentees is to manufacture liquor cocks out of sheet brass, or other suitable material, by stamping a piece of brass of an appropriate size, by a powerful press and suitable dies, into the form required to constitute the exterior casing, and by a similar process to form the interior of the cock. These pieces are then to be soldered together, with the seam of the one piece on the side opposite to the seam of the other.

The plug is also formed of two pieces of sheet brass stamped into form and soldered together, and also to a top piece which is cast solid. The hollow cavities above and below the liquid way through the plug are to be filled up with solder or lead according to the purpose for which the cock is intended.

It is to be regretted that the patentees have not pointed out, in their specification, the advantages of this new method of manufacturing cocks, for the benefits seem far from being obvious, and we fear but few will be able to discover them.

Woollen Cloth.—To Henry Hirst, of Leeds, Yorkshire, clothier, a patent for "certain improvements in manufacturing woollen cloth," was granted on the 27th of February, and the specification was enrolled in the Rolls Chapel Office on the 23d of August last.

Mr. Hirst's improvements apply exclusively to the process of finishing or giving the final gloss to woollen cloth, and is used instead of the process usually denominated roll boiling. The general arrangement of this apparatus is represented by fig. 5, Plate X. A hollow cylinder of about four feet diameter and six feet wide is made of wood, and supported on an horizontal axis, so that the lower side of the cylinder may be considerably immersed in water contained in a trough placed under it. The piece of cloth to be operated upon is deposited upon a table,

from which it is wound upon the cylinder, being conveyed in its passage about a pair of stationary stretching rollers, by which it is laid evenly and tightly upon the cylinder. The cloth is to be secured upon the cylinder with a piece of canvass or other wrapper. The trough is then filled with clean water till it approaches nearly to the axis on which it is made to rotate very slowly through the medium of an endless screw acting on the periphery of a wheel in connexion with the axis, while the water is heated by means of steam to about 180° Farenheit. After the cloth has been thus kept in motion in the hot water a sufficient length of time, about eight hours, to give it the requisite gloss, cold water is to be applied, and the rotation continued for about twenty-four hours for the purpose of making the gloss permanent. During the latter process pressure is occasionally applied through the medium of a roller, which is forced down upon the main cylinder by screws acting upon the bearers of its axis.

FIRE-ARMS AND OTHER WEAPONS OF DEFENCE.—To C. Random, Baron de Berenger, of Target Cottage, Kentish Town, Middlesex, a patent for "improvements in fire-arms, and in certain other weapons of defence," was granted on the 27th of February, and the specification was lodged in the Enrolment Office on the 27th of August, 1830.

The improvements in fire-arms here contemplated are of two kinds: first, the lock is rendered more secure against accidental discharges; and, secondly, the percussion powder or priming and charge are better protected from wet by rain or accidental immersion in water. The security against accidental discharges is obtained by interposing between the hammer and the touch-hole a piece of metal to receive the blow in case of the tricker being moved. This guard, which turns back on an arm, can only be removed by drawing back a sliding plate placed under the stock immediately before the tricker-guard; and this sliding plate is drawn back by the left hand when pressing the fowling-piece against the shoulder in the act of firing, so that no discharge can take place unless the piece is pressed against the shoulder at the same instant that the tricker is drawn. Another modification of this protecting apparatus is described to consist of a pin in connexion with the sliding plate, situated as before, passing into the tricker, and preventing it from moving till the sliding piece is drawn back as in the other case; and, to render both these plans still more secure, the sliding plate is fixed by a small screw, which can only be released by a

key similar to a watch-key. This may be useful occasionally when a loaded gun is put aside.

To protect the percussion-powder, priming, charge, &c. from the injury of rain, the patentee proposes to have the lock entirely within the stock, and an opening, which serves to introduce the percussion caps, has a cover which fits air-tight upon it. The touch-hole in this case proceeds in a sloping direction through the breech to the middle of the concave surface of the front of the breech. A vent-hole is opened by the act of firing, which allows the escape of the smoke arising from the firing of the priming.

Baron de Berenger's improvements in other defensive weapons consist in a method of better securing bayonets on the muzzles of muskets than that generally adopted, and a method of regulating the weight of a sword to the strength of the man using it. When bayonets are made to fit tightly on the muzzle of muskets, they are difficult to fix and unfix, and when they are made to fit loosely they are likely to be accidentally unfixed when in use, or a horseman can sometimes dexterously unfix them with his sabre. To remedy these defects, the Baron proposes to make the bayonet pass over a projecting sight on the musket in the usual way; but, instead of the notch for the projection turning twice at right angles, he only turns it once, passing it on by a longitudinal slit of the whole length intended, and then turning it in a transverse slit about a quarter of a revolution. Now, to prevent the bayonet from being turned round and accidentally detached, the ramrod passes into a projecting eye in the bayonet. In order to effect this, the ramrod is to be withdrawn about half an inch, when an opening in the side of the eye passes over the rod; and when it is again returned, a thicker part of the rod fit into the eye, and prevents the bayonet from being turned till the rod is again withdrawn half an inch. This is really a very simple and secure method of locking the bayonet to the musket.

The other improvement, which applies to the broad or cutting kind of swords, and not to the small or stabbing swords, consists simply of a piece of metal secured upon the back of the sword by screws, and this can be removed at pleasure nearer to or farther from the point to regulate the weight, and consequently the momentum of the sword to correspond with the strength of the man using it; for, as his strength varies by exercise or otherwise, he can vary the momentum of his weapon.

Steam Engine.—To William Grisenthwaite, of Nottingham, Esq., a patent for "certain improvements in steam engines,"

was granted on the 27th of February, and enrolled in the Enrolment Office on the 26th of August last.

The certain improvements here contemplated are of the most extraordinary kind we have ever met with in a specification of a patented invention, for it is merely said to be the application of iron weights with the mercury on other fluid metallic substance in the rotatory engine patented by Mr. James Watt in 1769. The iron weights are to be furnished with anti-friction rollers to facilitate their motion in the channel of the wheel. The present patentee does not describe the engine to which he is to apply his improvements; and as Mr. Watt invented and patented several, and notices them in the following vague terms, it is difficult to comprehend the precise nature of the present invention. Mr. Watt says, "when motions round an axis are required, I make the steam vessels in form of hollow rings or circular channels, with proper inlets and outlets for the steam, mounted on horizontal axles like the wheels of a water-mill. Within them are placed a number of valves, that suffer any body to go round the channel in one direction only. In these steam vessels are placed weights, so fitted to them, as entirely to fill up a part or portion of their channels, yet rendered capable of moving freely in them by the means hereinafter mentioned or specified. When the steam is admitted into these engines between these weights and valves, it acts equally on both, so as to raise the weight to one side of the wheel, and by the re-action on the valves successively to give a circular motion to the wheel, the valves opening in the direction in which the weights are pressed, but not on the contrary. As the steam vessel moves round, it is supplied with steam from the boiler, and that which has performed its office may either be discharged by means of condensers, or into the open air."

In addition to the improvements on Mr. Watt's rotatory engine, Mr. Grisenthwaite claims the application of mercury to the rubbing parts of machinery generally, instead of oil or other lubricating material.

Piano-fortes.—To Simon Thompson, of Great Yarmouth, Norfolk, mariner's compass maker, a patent for "certain improvements in piano-fortes," was granted on the 27th of February, and the specification was deposited in the Rolls' Chapel Office on the 26th of August, 1830.

The improvements contemplated by this patentee apply to the kind of instruments which have been distinguished by the appel-

lation of cabinet piano-fortes, and the object is to obviate the necessity for any part of the casing rising above the locking board, so that the top of the instrument is made flat like a table, and there is no silk front before the performer to deaden the voice in case of accompaniment. This object is effected by lowering the string frame till its upper surface coincides with the top of the locking board, and making the keys-bent levers turning twice at right angles between the fulcrum on which they move, and the extremities which act upon the hammers. On the inner ends of each key, rests an upright guide wire or slight rod, and to this are attached various projecting pieces which actuate the hammers, the dampers, &c., much in the usual manner, so that this improvement, which is a very important one, is obtained without in the smallest degree altering the other parts of the instrument.

Rigging Vessels.—To P. C. de la Garde, of Exeter, a patent for "certain improvements in apparatus for fidding and unfidding masts, and in masting and rigging vessels," was granted on the 27th of February, and the specification was lodged in the Enrolment Office on the 27th of August last.

The old method of fixing and unfixing top and top-gallant masts is attended with considerable inconvenience and insecurity, and hence have been proposed at different times various plans for facilitating the operation. For several of these patents have been obtained, which we have described in the *Register of Arts;* we do not, however, recollect any of the plans which are more likely to come into general use than the one before us, as all the operations connected with it are such as seamen are in the constant habit of performing. The fid, which supports the upper mast, consists of two wedges or keys passing from opposite sides over the trestle-trees through a slit in the mast. The wedges are placed with the thick end of the one over the thin end of the other, that the seat on which the mast rests may be horizontal; and they are drawn into their places by tackles hooked to their smaller ends, at the same time they are sent home by the blows of a mallet applied to their thick ends. When the wedges are brought home, they are secured in their places by locking pieces connecting their ends. The operation of unfidding is performed by changing the tackles from the hooks in the small ends to those in the large ends of the wedges, and drawing them back, the locking pieces being at the same time disengaged. All these operations are greatly facilitated by a series of anti-friction rollers

placed between as well as above and below, these wedge-shaped pieces constituting the fid.

The patentee next describes his method of masting to consist of a kind of iron frame of a rectangular form, with diagonal stays fixed with iron straps to each side of the lower mast near its top. To these iron frames the shrouds are to be hooked instead of being attached to the mast in the usual way by means of fastenings which project on every side, and which therefore keep the upper mast so far from the lower as to render the fidding both clumsy and insecure.

An improvement in fastening the main sheet and other sails is next described. This consists in placing an iron rod to extend from the forepart angularly across the vessel to the starboard or larboard side according as the vessel is upon the starboard or larboard tack. Upon this rod is placed a traversing pulley, which is used for tightening the sail, and the advantages of this arrangement is that the pulley can be brought opposite the sail, or rather the end of the yard, in whatever direction it may be placed.

WINDING AND ROVING.—To J. C. Dyer, of Manchester, Lancashire, patent card manufacturer, a patent for "certain improvements on, and additions to, machines or machinery to be used and applied for conducting to, and winding upon spools, bobbins, or barcels, roving of cotton, flax, wool, or other fibrous substances of the like nature, partly communicated by a foreigner," was granted on the 27th of February, and the specification was lodged in the Enrolment Office on the 27th of August last.

Mr. Dyer formerly patented an apparatus for winding, roving, &c., fibrous substances, and the present invention consists of improvements on the same. A series of guide tubes, through which the straws pass in their way to the bobbins, are sometimes to be placed in pairs, converging at the ends, which deliver the strands on the bobbins, so that each pair of strands is deposited together on the bobbins. A second plan is described to consist of an arrangement of the conducting tubes in a position parallel with each other to deliver the strands on a series of separate bobbins placed on the same axis. A third plan is to arrange the conducting tubes in a parallel position as before to deposit the strands on several parts of the same long bobbin. And a fourth plan is the application of the pressure of a heavy roller on the bobbins during the process of winding, which, with the passage of the strands through the tubes so condenses them, that end

pieces are not required to keep them in their places on the bobbins.

Bits.—To John Surman, of Hounslow Barracks, lieutenant and riding-master in the Tenth Hussars, a patent for "improvements in bits for horses and other animals," was granted on the 6th of July, and specified in the Enrolment Office on the 28th of August, 1830.

The improvements contemplated by this patentee are of two kinds—the first having reference to the form of the bit, and the second to its connexion with the frame of the bridle or rein levers. With respect to the first, it would appear that the lieutenant has not yet ascertained which is the best form to be adopted, for he describes several. One plan is to introduce a circular bend in its middle (thus —⌒—); another, with an elliptical opening in its middle (thus —⬭—); a third, with the middle spread out into three branches; and a fourth, with it spread out into four. These are described without any instructions as to the circumstances under which any one, or all of them are to be applied. The first form is certainly not new, and the third and fourth are far from being good, as they will cause a constant pressure on the tongue of the animal to which they may be applied. The improvement in the attachment of the bits consists in permitting the bit, of whichever form, to rotate in the side frames with which it is connected; and this rotation is obtained either by making the bits hollow, and passing a fixed axis through them, or else converting their ends into pivots to turn in the frames, with collars either screwed or rivetted on their ends to prevent their slipping out. The rein levers, which are made hollow to a certain extent, are connected to the bridle-frame by means of spiral springs, that they may, on the application of force, deviate a little from the rectangular position, and rest upon a projecting circular shoulder.

Granulating Sugar.—To T. R. Guppy, of Bristol, Sugar Refiner, a patent for "a new apparatus for granulating sugar," was granted on the 6th of March, and the specification was deposited in the Enrolment Office on the 6th of September, 1830.

The intention of Mr. Guppy's invention is, to facilitate the evaporation of the aqueous portions of the syrup during the operation of boiling, which he proposed to effect by causing a quantity of atmospheric air to pass through the syrup during the operation of boiling. The manner in which this is to be effected

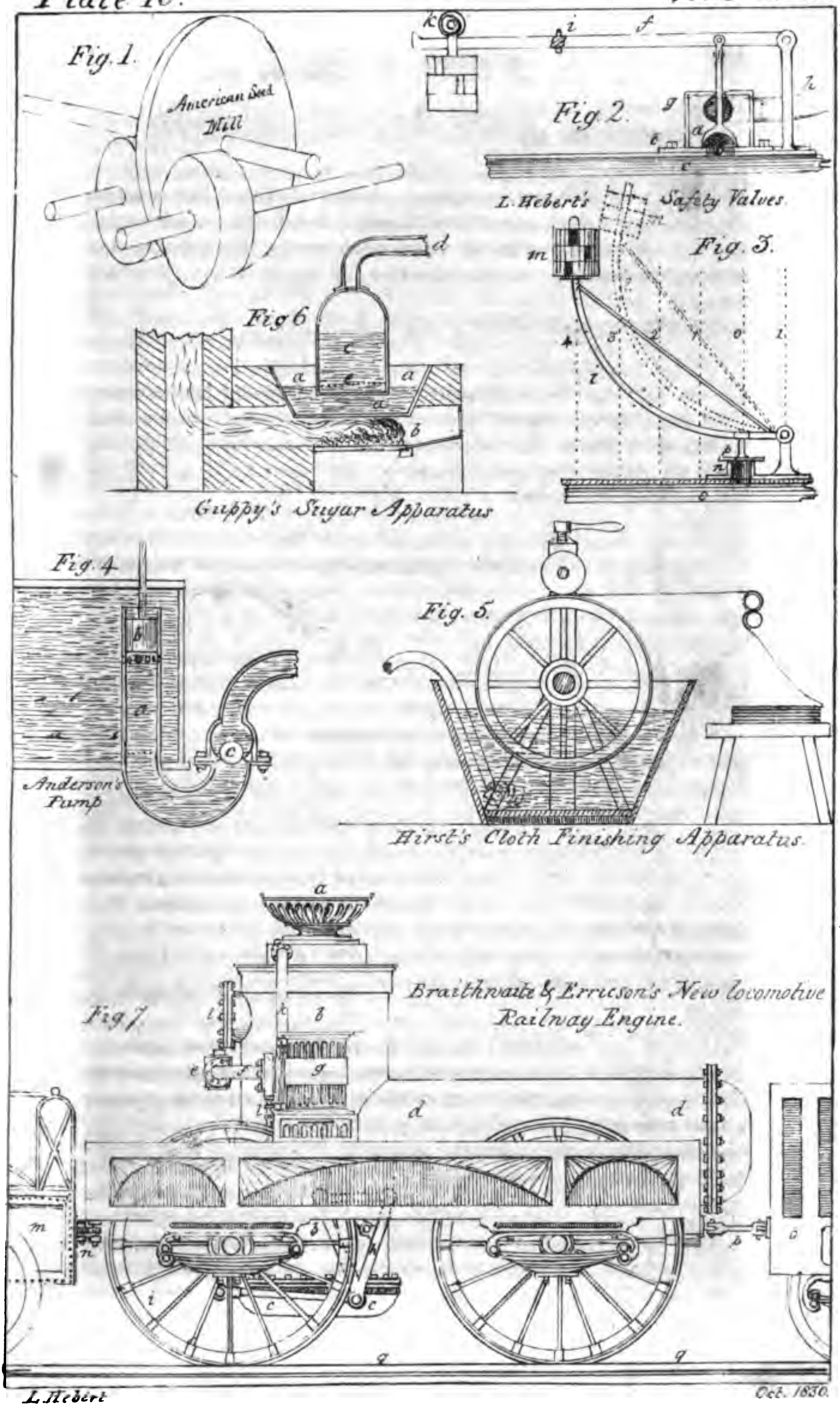
will be readily understood by inspecting fig. 6, Plate X, where A A represents the sugar pan; B the fire place surrounded by brick work, with a flue passing off to the right hand; C a large inverted bell-shaped vessel, with its open end inserted into the syrup in the pan A; D a pipe proceeding from the vessel C to an air-pump, by which a partial exhaustion in C is effected; E is a perforated bottom distributing the air through the mass of syrup in the vessel C.

By the operation of the air-pump the syrup is drawn into the C, until its surface descends to the bottom of the vessel, and then atmospheric air will commence and continue to pass through the syrup in C as long as the exhaustion is kept up by the operation of the air-pump. By this means an abundant evaporation is obtained, while the temperature of the syrup is considerably below the boiling point.

Brick Making.—To Ralph Stevenson, of Colridge, Stafford, Potter, a patent for "improvements in machinery for making from clay or other suitable materials, bricks, tiles, and other articles," was granted on the 6th of March, and the specification was enrolled in the Petty Bag Office on the 6th of September, 1830,

Mr. Stevenson employs a strong rectangular box, open at top, with a piston which fits and moves within it. On one or more of the sides of the box, at the bottom, are made tapering apertures, into which are fitted a series of moulds, with openings to correspond with the end section of the bricks, tiles, &c. which are to be made. This box being charged with prepared clay is brought on a kind of rail-road under a powerful screw press, by which the piston is forced down on the surface of the clay, pressing it through the moulds in continuous pieces of the required form, which are to be finished by cutting them into appropriate lengths.

The screws of the press are put in motion through the medium of a set of bevil wheels and a shaft, communicating with a steam engine or other first mover: and the motion is reversed for the purpose of raising the piston when all the clay is pressed out of the box, by a fast and loose pulley, or any other of the well known methods of reversing motion.



L. Hebert Oct. 1830.

LIVERPOOL AND MANCHESTER RAILWAY.

THE metallic lines of road which connect the above-mentioned great towns together being completed, they were opened for public use on Wednesday the 15th of September, before countless myriads of people assembled to witness the parade and ceremony intended for the occasion; this was however only half performed, owing to a lamentable accident having befallen Mr. Huskisson, M. P. for Liverpool, which after several hours of severe suffering caused his death.

We have already at page 97, in our last volume, given an extended notice of this admirable public work, and as all the details have been published in most of the provincial and metropolitan newspapers; and a complete history of the undertaking has been published by Mr. Booth, the Treasurer to the Railway Company; we conceive that it will be more satisfactory to our readers to fill up our space with information of a novel character, rather than that which the public press generally has teemed with for several weeks past:—accordingly we purpose being very brief in our statements.

From Liverpool the railway commences with the tunnel, one end of which is in Wapping, near the Queen's Dock, and extending under the town of Liverpool, nearly from West to East to Edge Hill, a distance of rather more than a mile and a quarter. It was constructed in seven or eight separate lengths, each communicating with the surface by means of perpendicular shafts. Its total length is 2250 yards, or rather more than 1¼ mile. The first 270 yards from Wapping are perfectly level; in the remaining distance of 1980 yards there is a uniform rise of three-fourths of an inch in the yard, so that the mouth of the tunnel at Edge Hill is 123 feet higher than the Wapping end. The tunnel is whitewashed throughout, and lighted with gas, and the effect produced is very singular and picturesque.

The rails used on the road are made of forged iron, in lengths of five yards each, and weigh 35lbs. per yard. Every three feet the rails rest on blocks of stone, let into the ground, containing each nearly four cubic feet. On the embankments, where the road may be expected to subside a little, the rails are laid on oak sleepers. For 18 miles of the road the rails are placed on stone blocks, and for the other 13 on sleepers. The double line of rails for the carriages are laid down with mathematical correctness, and consist of four equidistant rails, four feet eight inches apart, about two inches in breadth, and rising about an inch above the surface. About half a mile from the tunnel the railroad crosses Wavertree Lane, and there is then a descent for five miles and a half, at the rate of 1 in 1320, or four feet in the mile. About half a mile to the north of Wavertree, at Olive Mount, there is an excavation through the solid rock, seventy feet below the surface, and two miles in length. The road is here little

more than barely sufficient for two carriages to pass. The road is then carried, by means of a great embankment, varying from 15 to 45 feet in height, and from 60 to 135 feet in breadth at the base, across a valley at Roby, or Broad Green, two miles in length. It then crosses the Huyton turnpike road a little past Roby; 6¾ miles from Liverpool there is a junction railway for the conveyance of coals from the neighbouring mines on the right; and at a distance of seven or eight miles from the Liverpool station it comes to the Whiston inclined plane, which is 1½ mile long, and rises about one in 96. There is here a stationary engine to assist the carriages in there ascent. For nearly two miles the road is then on an exact level. It was on this part of the road that the contest of locomotive carriages, for the premium of £500 (described in our last volume, page 110) took place, in October last, the result of which determined the directors to make use of locomotive engines instead of stationary ones. About half a mile trom the Whiston plane, at Rainhill, the Liverpool and Manchester turnpike road crosses the railway at an angle of 34 degrees. On leaving the level at Rainhill, the railway crosses the Sutton inclined plane, which is of the same extent as that at Whiston, and descends in the same proportion that the other rises. There is here another stationary engine. A little beyond Rainhill several collieries communicate with the road by means of railways, and the Runcorn Gap Railway will here cross the line to St. Helens.

The next object of interest is Parr Moss, the road over which is formed principally of the clay and stone dug out of the Sutton inclined plane, and extends about three-quarters of a mile. The moss was originally about twenty feet deep, and the embankment across it is nearly twenty-five feet high, though only four or five feet now appears above the surface, the rest having sunk below it. The road is then carried over the valley of Sankey, by means of a massive and handsome viaduct; consisting of nine arches, of fifty feet span each; the height of the parapet being seventy feet above the Sankey Canal in the valley beneath. The viaduct is built principally of brick, with stone facings, and the foundations rest on piles of from twenty to thirty feet in length driven into the ground. The breadth of the railway between the parapets is twenty-five feet. The viaduct is approached by a stupenduous embankment, formed principally of the clay dug from the high lands surrounding the valley. The appearance of the vessels sailing in the canal, 70 feet beneath the viaduct, has a romantic and striking effect. It is situated about 14½ miles from Liverpool. The expence was £45,208 18*s*. 6*d*. A little to the south of the town of Newton the railway crosses a narrow valley, by the short but lofty embankment of Sandy Mains, and a handsome bridge of four arches, each 40 feet span, under one of which passes the Newton and Warrington turnpike road. The Wigan and Newton Branch here enters the railway.

A few miles beyond Newton is the great Kenyon excavation, from which above 800,000 cubic yards of clay and sand were dug out. The Kenyon and Leigh Junction Railway here joins the Liverpool and Manchester line, and, as it also joins the Bolton and Leigh line, brings into a direct communication Liverpool and Bolton. The Liverpool and Manchester Railway then passes successively under three handsome bridges, and, a little beyond Culcheth, over the Brosely embankment, which is about a mile and a half in length, and from 18 to 20 feet in height. It then passes over Bury Lane, and the small river Gless, or Glazebrook, and arrives at Chat Moss. This is a huge bog, comprising an area of about 12 square miles, so soft that cattle cannot walk over it, and in many parts so fluid, that an iron rod laid on the surface, would sink to the bottom by the effect of its own gravity. It is from 10 to 35 feet deep, and the bottom is composed of clay and sand. It was accounted by some an impossibility to carry the road across this huge bog; but by ingenuity and perseverance the work has been effected, and a firm road is now carried across the moss. Hurdles of brushwood and heath are placed under the wooden sleepers supporting the rails, over the greatest part of the moss, and the road may be said to float on the surface. The most difficult part was on the eastern border, extending about half a mile, where an embankment of 20 feet in height was made, and many thousand cubic feet of earth sunk into the moss and disappeared before the line of road approached the proposed level. At length, however, it became consolidated; in 1829, one railway was laid over the whole moss, and on the 1st of January, 1830, the Rocket steam-engine, with a carriage and passengers, passed over it. The line extends across the moss, a distance of about four miles and three quarters, and the road is not inferior to any other part of the railway. The work was completed at an expense of 27,719*l.* 11*s.* 10*d.* On leaving Chat Moss, the road passes over the lowlands at Barton, extending about a mile between the Moss and Worsley Canal, by means of an embankment; it is carried over the canal by a neat stone viaduct of two arches; it then proceeds through Eccles and a portion of Salford, under six bridges; it is carried over the Irwell by a handsome stone bridge of sixty-three feet span, thirty feet from the water, and then over twenty-two brick arches, and a bridge over Water Street, to the Company's station in Water Street, Manchester, a distance of thirty-one miles from the Liverpool station. The railway is there on a level with the second story of the Company's warehouses. On the line between Liverpool and Manchester there are, besides culverts and foot-bridges, sixty-three bridges, of which thirty pass under the turnpike road, twenty-eight over it, four over brooks, &c. and one over the river Irwell. There are twenty-two of brick, seventeen of wood and brick, eleven of brick and stone, eleven of wood, and two of stone and wood, at a total expense of 99,065*l.* 11*s.* 9*d.*

From the top of the Liverpool tunnel to Manchester, with the exception of two inclined planes at Rainhill, (one ascending and

the other descending, at an inclination of 1 in 96, and where some assistant power must be used) there is no greater inclination than in the ratio of about 1 in 830; and since the advantage on the descending side will nearly counterbalance the disadvantage in ascending so gradual a slope, the railway may be regarded, for practical purposes, as nearly horizontal. The rails at the mouth of the tunnel, at Edge-hill, are 46 feet above the rails at the Manchester end of the line.

Along the line, there are at every mile, and quarter of a mile, posts showing the distance from Liverpool to Manchester. The charge of freight for goods, and the fares of passengers, have not yet been fixed. It is supposed that at first the fares for passengers by the covered coaches will be 6*s.* and the inferior, or outside ones, 3*s.* 6*d.*

In the formation of the railway there have been dug out of the different excavations, upwards of three millions of cubic yards of stone, clay, and soil, and the weight of the double lines of rail laid down is more than 4,000 tons. The total expenditure of the Company, in actual payments, up to the 31st of May last, was 739,165*l.* 5*s.*; and the directors, in their report of March last, state, that for the finishing of the work, wallings, fences, warehouses, &c. a further sum of 80,834*l.* 15*s.* will be necessary; thus making the whole sum expended on this magnificent and national undertaking 820,000*l.* or more than double the estimate made in the first prospectus of the Company.

The railway was opened with eight locomotive engines, all constructed by Messrs. Stevenson and Co. of Newcastle, each engine drawing a train of carriages containing the company, which amounted in the whole to 600 persons. The editor of the Mechanics' Magazine states, "it was expected that those engines, constructed by Messrs. Braithwaite and Ericsson on their patent principle, would have been also in readiness, namely, the far-famed Novelty, and two new engines which Messrs. B. and E. had contracted to build for the Railway Company, not exceeding five tons weight, and capable of drawing forty tons gross, at the rate of fifteen miles an hour, the consumption of coke not to exceed half a pound weight per ton per mile; but these engines not having arrived from London early enough to be subjected to a preliminary trial, the directors thought it would not be prudent to allow them to make part of a procession, which it was of the utmost consequence should be exposed to as few risks of failure as possible." This statement is directly at variance with the accounts given in the newspapers several days previous to the day appointed for opening the railway. One of them must be in error, and as probably neither are disposed to "acknowledge and confess" the exact truth, we will take leave to examine a little into the evidence of the before-mentioned learned editor, who, at p. 67 in his last number, expresses himself as very dissatisfied with the performance of Mr. Stevenson's engines. He says, "we went still slower than before, stopping *continually* to take

in water, (query, to take breath,) and creeping on at a snail's pace, &c." Again, in allusion to the accident to the late Mr. Huskisson, he observes, " it seems to us that Parliament would do well to pass a law, enacting that no locomotive carriage shall run on a public railway which is not provided with machinery sufficient *to stop it when going at any velocity within a space of twenty or thirty yards.*" Now, with all due deference to our contemporary, " it seems so us," that Parliament must in that case make the *engine*, or make a new *law of nature.* Fifty tons weight, moving at *any velocity*, (therefore the highest attained by Mr. Stevenson's, which was thirty-three miles an hour,) would not be disposed to stop so suddenly by virtue of any act of Parliament without a breach of the peace. We are, however, wandering from our object. The readers will observe *what* these engines of Mr. Stevenson's, which were so unmanageable and sluggish, did on the following day, according to the same writer's account, p. 69.

" On the Thursday morning, after the opening of the railway, the Northumbrian left Liverpool with 130 *passengers*, and arrived at Manchester *in one hour and fifty minutes.* In the evening it returned with 120 passengers and three tons of luggage in one hour and forty-eight minutes." Again, " on Friday the 17th, *six* carriages commenced running regularly between the two towns, one starting from each place at the hours of seven in the morning, twelve at noon, and four in the afternoon. The time occupied in the journey is seldom more than two hours, and *often less.*"

Now, *supposing* these statements to be the best performances of Mr. Stevenson, which are probably below the mark, how insignificant in comparison are those made subsequently by Messrs. Braithwaite and Ericsson, according to the same impartial editor, who thus describes the performances of Messrs. Braithwaite and Ericsson's chosen engine.

" On Tuesday last the William the Fourth, so named by the special permission of his Majesty, made its appearance at the Manchester end of the line, and exercised for two or three hours. On Wednesday it made *the trip to Liverpool in two hours and twelve minutes (deducting stoppages);* and on Thursday evening again increased, *as* at Manchester, for about an hour, on the level between Edge Hill and Olive Mount. It is an engine of about twenty-horse power, (the cylinder twelve inches, stroke fourteen,) and to all appearance perfectly capable of performing all the work which Messrs. Braithwaite and Ericsson have contracted it shall perform, namely, drawing the enormous load of forty tons at the rate of fifteen miles an hour." From *this very* statement, it appears that the " crack" engine, which was to leave at an immeasurable distance all other similar attempts, *has not done half so much* as Mr. Stevenson's! The " Northumbrian" drew a train of carriages, containing 120 persons and three tons

of luggage, from Manchester to Liverpool in 108 minutes, *including stoppages*, while the "William the Fourth" drew, drew ITSELF, weighing five tons, the same distance in 132 minutes, *deducting stoppages!* Now, we must not suppose that the two cases were stated so differently to confuse the ideas of the careless reader. Mr. Robertson ought, however, to have told us what these stoppages deducted were for, whether they were "*to take in water continually*," or "*to take breath*," or both? Perhaps the editor, or Mr. Braithwaite, who writes so ably in that work, will condescend to tell us in their next number, and at the same time what was the quantity of water and fuel consumed. Notwithstanding, we are told in the same page as the above quotation, that the "saving in fuel by this engine is incredible;" we wish to have our faith on that point put to the test by a fair statement. In our view of the matter, there is nothing *wonderful* in the performance of any of the engines, four or five horses would do as much for a mile or two together; but very great credit is due to Mr. Stevenson for rendering the railway so efficient, and for producing the most effective railway carriages hitherto constructed. The external appearance of Messrs. Braithwaite and Ericsson's new engines are certainly very beautiful, and we have for that reason given an elevation of "William the Fourth" in Plate X.; but we must defer until our next the insertion of a verbal description of it for want of space. The letters put on the figure will render that description intelligible.

ENQUIRY ON THE CAUSES OF THE EXPLOSIONS OF STEAM ENGINE BOILERS.

TO THE EDITOR.

SIR,—"The Franklin Institute of the state of Pennsylvania, for the promotion of the Mechanic Arts," have had their attention lately called to the subject of the explosion of steam boilers, by the lamentable number of accidents that have occurred in steamboats during the present season; and by the painful circumstances which have in many cases attended these accidents. They have long had the subject before them, and are impressed with the hope, that those explosions were produced rather by imperfection in the construction, arrangement, or management of the machinery, than by any inherent and irremediable source of danger in the invention itself. Feeling a high interest in the promotion of the success of the mechanic arts, and especially of that of steam navigation, which with pride they consider as peculiarly the offspring of American ingenuity and perseverance, they have appointed the undersigned a committee for the purpose of inquiring:—

1st. What are the probable causes of the explosions of boilers on board of steamboats?

2nd. If any, what are the best means to obviate the recurrence of these evils, or to diminish the extent of their injurious influence, if they cannot be wholly guarded against?

3d. By what means can those remedies be applied and enforced?

We are aware, that no investigation of so difficult and extensive a subject, can be productive of good, unless it occasion a concentration upon one point, of all the information that results from the use of steam boats over so vast a country as ours, during a period of upwards of twenty years. With this view, we beg leave to call your attention specially to it, and to request that you may be pleased to communicate to us the result of your observation, experience or reflection, on these interesting questions. We shall feel thankful to you, particularly for an account of any explosion, which may have occurred in your vicinity, or under your observation, or of which you may have obtained correct information. By collecting the *facts* in a number of explosions, we may be able to arrive at some satisfactory conclusions, as to the causes which produce them. We are aware, that these may have been different, in different cases, and we are by no means prepared to assume as certain, that a simple aud efficacious remedy will be devised, but we hope it may be found; and without any undue interference with the rights of individuals, or with the freedom of commerce and industry.

We had at first, proposed to draw up a series of questions for publication and circulation, but upon mature diliberation prefer to leave the subject open, assuring you, that any information or suggestion will be thankfully received, and duly acknowledged in the report which we shall make of the result of our investigation. We beg leave, however, to suggest a few general heads, which may direct your attention to those points upon which we are chiefly anxious to obtain information, viz:—

The Boiler.—Its size, form and relative thickness, the material from which it is made, (of copper or iron, &c.) if of iron, whether of foreign or American iron, especially in the boilers that exploded.

Safety Valve.—Its form, size, load in proportion to the thickness of the boiler, liability to get out of order, facility of repair, number used, location of the valve.

Supply of Water.—Mode of insuring a sufficiency, how guaged?

Arrangement of the Boilers in the Boat, which is the least liable to accident?

Construction of the Boat—to avoid the accidents in the boilers.

In addition to these, we will add, it is our wish that the investigation should take the widest range, and we beg that you will give the same scope to your answer.

Please direct your reply, to Mr. William Hamilton, Actuary of the Franklin Institute.

W. H. Keating,	J. K. Mitchell, M. D.
Robert Hare, M. D.	Benjamin Reeves,
Samuel V. Merrick,	George Fox,
Alexander Dallas Bache,	Thomas P. Jones, M. D.
Isaiah Lukens,	Walter R. Johnson,
James I. Rush,	M. W. Baldwin,
James Ronaldson,	James P. Espy.
Frederick Graff,	George Merrick.
Robert M. Patterson, M. D.	

We have published the foregoing letter in this work, in the hope that some of our intelligent readers may be induced to further the laudable object of the members of the Franklin Institute, by furnishing them with such information as their experience may enable them to afford. Such communications may be addressed to the care of P. Vaughan, Esq. of No. 70, Fenchurch Street, who has kindly undertaken to forward them without loss of time; any papers sent to us on the subject we shall take pleasure in transmitting without delay, through the same respectable medium.

We are delighted to observe, that the investigation of a subject of such *vital* importance, has been undertaken by a body of men so eminently qualified to the task, by their scientific and practical knowledge, as appears by the foregoing list of names subscribed to the circular letter. What a contrast do they present to the men selected by a British "House of Commons" for a similar purpose in 1817:—out of five and twenty individuals, not one of them possessed any information derived from *practical* experience, and certainly not five of them who ever did, or ever could, make any pretensions to the *theory* of science, while nearly all the rest consisted of merchants, bankers, including five or six aldermen.* In disputed cases of patent right at law, wherein the question is purely one of science, men similarly educated are chosen to determine it. Not being able to discriminate between partial, mistaken and correct evidence, they are obliged to consider all the statements as of equal current value; therefore after hearing the bantering of the counsel (who usually resort to that mode of proceeding from not understanding the matter) and the puzzling elucidation of the "*learned judge*," they sum up the debtor and creditor sides of the account, and striking a balance, give their verdict on that side to which the QUANTITY of evidence predominates.

* This committee commenced its sittings May 8, 1817, and consisted of the following individuals:—Charles Harvey, Esq., in the chair; Mr. William Smith, Mr. Davies Gilbert, Sir Martin Folkes, Sir James Shaw, Sir William Curtis, Sir Charles Pole, Mr. Alderman Atkins, Mr. Williams Wynn, Sir Edward Kerrison, Mr. Lacon, Mr. Shaw Lefevre, General Thornton, Mr. Edward Littleton, Mr. Finlay, Mr. Leader, Mr. Alderman Smith, Mr. Wrottesley, Mr. Barclay, Sir James Graham, Mr. Swann, Mr. Charles Dundas, Mr. Holmes, Mr. Thompson, and Mr. Bennet.

REPORTS UPON AMERICAN PATENTS DATED IN FEBRUARY, 1830.

[From the Journal of the Franklin Institute.]

For a Mill for preparing Bark, for tanning. MERRIT HURD, *Augusta, Oneida County, New York, February* 1.

A WOODEN cylinder turns upon gudgeons; this cylinder is furnished with rows of steel teeth set spirally round it. A bar of iron crosses the frame, and is placed so as just to clear the teeth of the cylinder. The bark is to be put into a hopper above the line of operation between the bar and cylinder. There is no claim whatever.

For a Machine for drilling Rocks for blasting. JOHN W. POST, *Washington City, and Calvin Post, Springport, Cayuga County, New York, February* 2.

A FRAME is made, in the centre of which an iron shaft or rod is caused to rise and fall vertically between friction rollers so placed as to keep it in its position. In the lower end of this shaft a socket is formed to receive drills of different sizes. Provision is made for placing the machine vertically, by sliding pieces upon each of its four legs, which serve to lengthen them as may be necessary. The apparatus for working the shaft up and down is formed as follows: a circular plate of iron, about a foot in diameter, has a hole in its centre, provided with a socket adapted to the iron rod or shaft, and capable of being secured at any part of it, so that the plate will stand horizontally. At a little distance from the periphery of this plate an iron spindle crosses the frame; upon this spindle are lifters, which, as it is turned by a crank, come in contact with the lower side of the plate, and raise the shaft; friction rollers are contained within the lifters, to cause them to slide easily upon the plate, and their action is so managed as to produce a small revolution of the plate, and consequently of the drill, at every lift.

For an Improvement in the Steam Engine, called the Lubricator, for applying lubricating substances to the inner surface of the Cylinder. BENJAMIN REEVES, *Philadelphia, Pennsylvania, February* 6.

THE claim of the patentee exhibits pretty fully the general object of the patent; it is in the following words. "What I claim as new, and as my own invention, is a mode or modes, by which lubricating substances may be applied to the interior surface of cylinders or other vessels in which moving pistons operate, in steam, hydraulic, or other engines, in such manner as to prevent their escape to the cavity of the cylinder, or other vessel, other than by contact with their surfaces."

Several modes, it is said, may be adopted for the purpose indicated, one of which is described in the specification; it consists in leaving a cavity around the piston, in the centre of the packing, which cavity is to receive the lubricating substance. A ring of iron, or other metal, is made of the size of the interior of the cylinder, a groove is formed on the outer edge of this ring, and when the piston is packed the ring is to be inserted in the middle of it. A tube, with a funnel and cock attached to it, passes through the side of the cylinder, and whenever the piston is brought to rest with the cavity opposite to the tube, the lubricating matter may be admitted. There is a second tube and cock on the opposite side of the cylinder to allow of the escape of air or vapour, which might obstruct the influx of the lubricating fluid. "The lubricator may be supplied when the engine is in operation, by means of cams, or other contrivance."

For a Machine for cutting Plasterer's Laths, for the ceiling of houses. JOHN N. LYNCH, *Dillsburg, York County, Pennsylvania, February* 16.

THIS machine consists of a long plank, which operates as a plane stock; this plank is made to slide upon its edge, between upright standards upon a firm platform; a wide iron, like a plane iron, is fixed so as to cut on one face of this plank, much in the manner of the cutters of some shingle machines; the throat of the plane, if we may so call it, has other cutters standing at right angles with the first cutter, and at such distances apart as to reduce the laths to a proper width. The cutter plank is made to traverse by means of a pitman at one end, operated upon by any suitable power.

"What I claim as new and of my original invention, is the entire machine as applied to the operation of cutting or dividing plasterer's laths, for ceiling houses, &c., and more particularly the dividing knives situated between the bearers for cutting laths to the proper breadth after they have been cut from the bolt by the main cutter."

The bearers above spoken of, are plates of iron which form a part of the face and throat, to prevent the wood from wearing.

For an Improvement in the Machine for stuffing Sausage Meat. SAMUEL FAHRNEY, *Washington County, Maryland, February* 16.

MR. FAHRNEY obtained patents for two machines, one for cutting, and another for stuffing sausage meat, dated December 9, 1828.

The present stuffing machine differs considerably in its construction from the former; it is more simple, and, we doubt not, is a better instrument. A cylinder, with four wings or leaves, is made to turn in a trough; these wings slide through the body of the cylinder, in the manner of the valves of Brahma's, Cooper's, and some other rotary pumps; a circular excavation in the trough, eccentric with the cylinder, serves to guide them in and out. A hopper is placed above the trough and cylinder, into which the cut sausage meat is to be put, which, on turning the cylinder, is carried down into the

trough, by the extended wings or leaves, and round to the opposite side where there is an opening through which it is to be forced, the form of the excavation in the trough causing the valves to recede, and preventing the carrying of the meat out again. To the opening a tin tube is attached, which extends several inches in length out of the trough, and upon this the gut to receive the meat is to be drawn. When the crank is turned the meat is forced out in a continued column. The claim is to the general construction of the machine.

For a diving apparatus, called the "Submarine Explorer." Sewall Short *and* Noah Bradford, *Barnstable, Barnstable County, Massachusetts, February* 18.

This diving apparatus consists of a hollow buoy which floats in the water, and is in form like an inverted bell. Both ends of this buoy, or bell, are open. It must be made of light materials, and covered with leather, or other substance, so as to render it impervious to water. There is a platform or seat around it on the inside, to accommodate the assistants. To the lower end of the buoy is attached a flexible water-tight tube, which may be two feet in diameter, and must extend down nearly to the bottom of the water. The tube is distended by strong iron rings, and sunk by means of weights: its lower part terminates in a water-tight dress, fitting the legs and arms, and kept distended, like the main tube, by suitable rings; light is admitted through openings occupied by strong panes of glass. The whole apparatus thus forms a bag open at top, but closed below. It is to be moored in a secure way, and to be of sufficient length to allow it to rise and fall with the motion of the water, without disturbing the operator.

A windlass is provided, which crosses the floating buoy, and is intended to draw the diver up when necessary, an air tube to force air down, and an hydraulic tube to pump any water up which may accidently enter, are also appended.

The claim is to the general arrangement and construction of the apparatus as above described.

We have omitted the description of some of the auxiliary apparatus, as unnecessary to our purpose. An instrument of the kind described would probably answer well in places where the water was not very deep; at great depths, the operator would find it extremely difficult to move about, as the large leather tube, must, to a certain extent, move with him; the pressure of a current, running with moderate force only, would be immense upon a tube of the requisite diameter, when extended to a great length.

The dress intended to fit the arms, and the lower parts of the body, is very similar to what has been already introduced, and used with some success.

Any flexibility in the main tube, to allow it to rise and fall with the motion of the water, must exist at the upper part only, as the pressure at considerable depths would be such as to prevent any such motion; the tube must there be so kept out as to be incapable of

being shortened by the folding in of the leather, or otherwise the buoy, or flat, would be drawn under water.

For a Door Spring. Isaiah Eaton, *Boston, Massachusetts, February* 24.

This appears to us to be a simple and neat application of a spring for closing doors. A barrel like that of a spring clock, encloses a spiral steel spring, which may be half an inch wide, and six or seven feet in length when unwound. One head of the barrel has a firm arbor, to which the inner end of the spring is fixed; this head is screwed on the under side of the upper part of the door frame. A cat gut, or other cord, winds around the periphery of the barrel, the other being fastened to a staple near the top of the door. The action will be at once perceived by every one acquainted with the operation of the main spring of a watch or clock. The barrel may be a neat brass box, and occupy but little room. When used for an outer door, the barrel must be fixed upon the door, and the staple on the door frame.

For an Improvement in Cradles or Cribs. John M. Read, *City of New York, February* 27.

In this cradle the child is not to be rocked from side to side in the usual way, but is to receive a vibrating motion longitudinally. There is to be a frame made with four legs, in form something like a child's crib, within which the cradle is to be suspended; the suspension is effected by allowing four strips to hang from rails on each side of the frame, one near each corner; these strips work on pins passing through their upper ends, admitting them to have a pendulating motion; the lower ends of the strips are attached to the bottom of the cradle by pins, or joints, similar to those at top. To a lower rail of the frame a treadle is fixed, for the purpose of rocking the cradle with the foot; a string is also attached to the cradle by which it may be moved by a person in bed, or the string may be passed round a pulley to enable the child to rock itself.

There is not anything particularized as claimed, and we are, therefore, left to the conclusion that the whole is new; the kind of sifting motion given to the cradle we believe to be absolutely so; its utility we are unable to discover.

[This is, however, the usual motion employed by nurses to *sift* children to sleep, and while we believe it is quite as effectual as the *rocking* motion, we doubt the *utility* of them both. The stupefaction induced by shaking the child's brains may make it sleep *oftener*, and the nurse may in consequence be more *frequently* relieved of her toil; but it seems rational to think, that were the child to sleep only, when nature brought it about that it would sleep *more* in the total, and more beneficially to its health, and the labour of the nurse greatly reduced.—Editor.]

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a Patent for an Improvement in the Percussion Gun-lock for Fire-arms. Granted to SAMUEL FORKER, *Meadville, Crawford County, Pennsylvania, February* 13, 1830.

THIS improvement consists in the simplification of the percussion lock in the new formation and arrangement of the parts, dispensing with all superfluous fixtures, and reducing the number to six, viz., the main spring, lever or cock, pivot, dog, tumbler pin, which also serves for trigger, and feather spring.

The main spring is affixed to the side of the barrel, and presses upwards against the lever (which is placed horizontally on the top of the barrel,) close behind the pivot. The lever is about two inches in length, with a concave hammer or a point, according as it is wanted for the percussion cap, or the grained percussion powder. It is let down into the pivot post, which stands perpendicularly on the side of the barrel, and is confined to its place, by a pin passing through it, about three-fourths of an inch from the hammer. To the hinder extremity is fastened the tumbler pin, passing perpendicularly through the stock behind the breech, and which is provided with notches, which, when the end of the lever is pressed down, take hold on a dog affixed to the end of the breech. When cocked, the lower end of the tumbler protrudes through the stock, and serves for a trigger. The feather spring is a thin piece of steel pinned to the back of the tumbler pin or trigger; the upper end of which, pressing against the hinder end of the lever, causes the notches of the tumbler to fall into a corresponding notch of the dog.

The inventor claims, as his exclusive improvement, the form and arrangement of the parts of the lock, so as to render it more simple, safe, certain, and effective.

Specification of a Patent for a Machine for grinding Flax Seed and other Kinds of Grain, Paints, Medicines, and other Substances. Granted to ASAHEL CROSS *and* EZRA BROWN, *Cazenovia, Madison County, New York, February* 4, 1830.

ON a horizontal shaft two feet six inches, or three feet in length, and ten inches from one end of the same, is placed a cast-iron wheel, eighteen inches in diameter, and one inch or more in thickness, the flat sides of which are turned straight and smooth. Two cast-iron wheels or cylinders, nine inches in diameter and four inches in thickness, the circular surfaces of which are turned straight and smooth, are placed on two shafts two feet in length, and near one end of the same. These shafts are placed in a horizontal position across, and at right angles with, the first-mentioned shaft, and from three to four inches below the same (measuring from centre to centre), one on each side of the flat wheel, and in such a manner as to bring the smooth surfaces of the cylinders in contact with the smooth sides of the flat wheel, the outer ends of the cylinders extending as far as the

outer extremity of the flat wheel at the point where they come in contact. The pivots on the ends of all the shafts run in boxes of metal, or other substance, attached to a frame prepared for the purpose.

The perpendicular flat wheel constitutes the principle of the improvement in the above machine, by operating between two cylinders or rollers similar to those heretofore in use.

Operation.—This machine is propelled by water, hand, or other power, by attaching a pulley and strap or other gear to each shaft. The seed, &c., is fed from above into the machine, on each side of the flat wheel, between that and the cylinders. The flat wheel and cylinders are put in motion in a direction calculated to draw the feed between them, the flat wheel and cylinders making an equal number of revolutions in the same time. For some uses this machine may be made much smaller than above described, but the flat wheel and cylinders should be nearly in the same proportion to each other.

The principle of this machine in its operation, in its improved form, is, it breaks the seed or substance, and at the same time, by the raking motion of the flat wheel against the cylinders, in consequence of their being placed below its centre, it effectually grinds or pulverizes it.

N. B. No drawing of this mill (which appears to be of a novel and efficient character) being given, the Editor of the Register submits a sketch, at Plate X. fig. 1, of what he understands the mechanical arrangement described to be.

Specification of a Patent for an Improvement in forming the Nap upon Woollen Cloths. Granted to Zachariah Allen, *Providence, Rhode Island, February* 2, 1830.

This improvement consists in extending the cloth, upon which it may be required to raise a nap, very smoothly and firmly over a solid arbor or edge, and in causing the wires or cards set in a cylinder to act only upon that portion of the cloth which is passing in actual contact around or over the solid arbor or edge, thus bringing the wires to act by a gauge or screw with accuracy and certainty upon all parts of the face of the cloth, and at the same time to penetrate no farther or deeper into the texture of the fabric than may be found proper to raise a nap without injuring the texture of the cloth.

The improvement herein claimed consists in causing the wires to act upon a portion of the surface of the cloth extended smoothly over a solid body, so that every part of the cloth, thus extended on a hard surface or solid body, may be brought under the action of the wires without a possibility of retracting therefrom, or bagging in the looser parts, and without having some portions of it more intensely acted upon than others, whereby the nap is not only unequally raised, but the cloth itself is subject to be chafed through and damaged, as is the case when it is attempted to raise a nap otherwise than when extended upon a hard smooth surface or cushion.

Specification of a Patent for certain Improvements in the Process of finishing Woollen Cloths. Granted to Zachariah Allen, *Providence, Rhode Island, February* 23, 1830.

This improvement consists in laying the folds of woollen cloths smoothly between metallic plates, and in this state immersing the cloth in steam or heated water, and in subjecting the cloth, whilst thus immersed in steam or hot water, to a heavy pressure, by means of a screw or otherwise. After remaining for a short time in this state, the cloth is allowed to become cold, or may be suddenly cooled by cold water, when it is to be withdrawn from the press. The cloth is then to be again folded in such a manner that those portions of the edges of the folds which were not subjected to pressure in the first instance, may be exposed to pressure in the second operation, which is to be completed in the same manner as the first. To prevent any marks or impressions upon the cloth from the edges of the plates, the cloth may be laid in folds of its full width, and made to extend together with the edges of the plates of metal by means of thin boards introduced between them, and of less superficial dimensions than the plates.

After undergoing the process, all sorts of woollen cloths are found to be rendered perfectly more compact in texture, and consequently more serviceable in retaining warmth and excluding moisture, although comparatively more thin and light, whilst at the same time the cloth is rendered more smooth and glossy.

The improvement here claimed, and the advantages of this process over the usual mode of pressing woollen cloths in a dry state either cold, or with hot plates of metal, consist in the following circumstances or parts: wool being a material very similar in its nature and properties to horn, (of which combs and other articles are formed,) if it be required to make any permanent alteration or impression on the texture of any fabric composed of it, the fibres of wool must be rendered pliable by remaining immersed in hot water or steam. Whilst in this pliable and yielding state it may be easily compressed, or moulded to the desired form, and if allowed to become cold before this compression is removed, the form impressed will remain permanently; on the contrary, when pressed in a dry state the fibres of wool retain all their elasticity, and however intense the pressure may be upon them, they will soon recover their former position, and the effects will be transient.

ON THE MANUFACTURING OF PERFUMED IMITATIVE WAX CANDLES.

Patented by M. Lorraine, of Paris.

Candles made of tallow only, are unctuous, opaque, greasy, little sonorous especially in summer, liable to run or gutter, and readily

acquiring a rancid smell. These inconveniences are avoided by putting fat, which has been melted and run into cakes, to ferment in a stove where the heat is moderate: this fat distils, and throws off an oily liquor, which is removed with a piece of linen or a sponge.

To free the grease from the fleshy and fibrous parts by which it is accompanied, it is first chopped, and after being washed in several waters, it is boiled with a given quantity of Roman alum. The alum soon separates and destroys the heterogeneous parts, and we obtain a pure clear fat, which will last a very long time. The fat chopped and melted is run into buckets full of water distilled from aromatic simples, such as lavender, thyme, rosemary, &c. The fat and water are beaten together with a spatula to effect an union. After forty-eight hours the fat is separated from the water by means of a water bath. The water alone is disengaged, and the aromatic and odoriferous parts remain incorporated with the fat. To complete the purification, the fat is liquefied and scummed till no foreign substance nor water remains: this will be known by the limpid state of the fat, which then yields only a pure white scum. Still greater purity is obtained by a second quantity of alum incorporated with the tallow.

Before casting or running the candles, a composition is made, of half wax and half spermaceti, which serves to prepare the wicks. This composition, harder and more cohesive than the tallow, makes the candles less subject to gutter, makes them firmer, last longer, and require less snuffing. At the moment of removing the pure liquefied tallow from the fire to cast the candles, a certain quantity of gum arabic dissolved in water, and united with a small quantity of wax and alum, is incorporated with it. The whole are beaten together, and when the tallow has settled well, and cooled to a certain temperature, it is poured into the moulds. By this preparation, in proportion as the cooling takes place, the foreign substances proceed to, and fix at the surface of the candles, forming a kind of covering, pleasant to the touch, like wax candles. This covering also prevents the candles from guttering, and enables a person to handle and even rub them without greasing the fingers, and without communicating any other smell than that of the aromatics entering into the composition.

The last operation for preventing the guttering of the candles when burning, and giving more solidity to them, is to prepare some glovers' size very weak, and boiled with another quantity of gum and alum, and to pass a hair-pencil dipped in this size all over the candles, and the next day after they may be used.

Candles prepared in this way are clear, transparent, sonorous, and last longer than others. They feel like bougies, and have the colour of pure wax.—*Journal des Brevets.*

EXTRAORDINARY LIGHT AND SIMPLE ROOF.

On passing through the London Docks a short time ago, we were much gratified in meeting, among the numerous important works going forward there, with a practical application of Mr. W. H. Palmer's newly-invented roofing, which was briefly described in our monthly report of new patents for August, 1829, (see p. 4, vol iv. N. S.) This singular roof, supported by light cast-iron pillars, forms a shed on one side of the basin near Wapping Church, and covers an area of about 4000 feet. Every observing person on passing by it, cannot fail being struck (considering it as a shed) with its elegance and simplicity, and a little reflection will we think, convince them of its effectiveness and economy. It is, we should think, the lightest and strongest roof (for its weight), that has been constructed by man, since the days of Adam. The total thickness of this said roof, appeared to us from a close inspection (and we climbed over sundry casks of stickey turpentine for that purpose,) to be, certainly not more, than *a tenth of an inch!* although stretching over a space of about 18 feet, by a slightly curved arch. It is composed wholly of malleable-iron plates or sheets, about two feet wide and five feet long; and each plate is so bent, as to form a series of uniform undulations, producing thereby, alternate grooves and ridges longitudinally, (corresponding somewhat with the figure of the ordinary earthen pantiles), which serve as water courses for the rain. This grooving, or as we might say, *arching* and *counter-arching*, confers great strength to resist the longitudinal and vertical pressure to which roofs are subjected. Every plate appears also to be slightly arched in the transverse direction, and as they afterwards form a portion of the curved line of the roof, a shell-like stiffness is given to the plates, which enables them to resist a greater force than they would be able with *plane* surfaces, were they several times their present thickness. It is also worthy of observation, that the inconvenience usually resulting from the expansion and contraction of such extended surfaces of metal by variations of temperature, is, by Mr. Palmer's arrangement of the grooves and arches in opposite directions, in a great measure, if not entirely, obviated.

Four of the plates we have described (5 feet by 2) are rivetted together end to end, and the united length of these (20 feet) forms the curve of the roof: these 20-feet pieces, like so many ribs, are next rivetted together laterally the whole length of the roof, which is about 200 feet. Parallel to this line, and connected to it at the back, is another range of similar roofing, differing only in the form of the arch, to take advantage of the support afforded by the brick wall of an adjoining warehouse. To prevent leakage, a cement is applied between the plates where they are rivetted together, and the rain is carried off by cast-iron gutters, which receive the edges of the arched-roof plates, the gutters being supported by a series of light cast-iron pillars about eighteen feet apart, to which they are connected by ornamental cast-iron brackets, adapted to that purpose. The gutters therefore connect the pillars together at the top in one

direction, and tie-rods are employed to connect them transversely, or at right angles, to the former.

We have given some sketches of this roof at Plate IX. fig. 2, exhibiting one of the plates in perspective; and fig. 3 a perspective view of the whole shed, which we trust will be fully understood after having read the foregoing description.*

NEW PUMP FOR THE SUPPLY OF WATER TO HIGH-PRESSURE BOILERS.

To guard against explosions in the ordinary high-pressure boilers, we are inclined to believe there is nothing more essential than a good force-pump, and that more accidents have occurred by the failure of this part of the apparatus than from any other cause. All valves, in the commonly understood sense of the term, should, if possible, be avoided. A pump has been suggested by Sir James C. Anderson, which, from its extreme simplicity, seems well calculated to answer the purpose; a diagram of it is sketched at fig. 4, Plate X. The water enters through perforations at the upper end of the tube *a*, when the plunger *b* is lifted into the position represented; and when the plunger makes the return stroke a metallic ball *c* is raised, and a quantity of water, equal to that contained in the tube between the perforations and the lowest point of the stroke, is discharged into the boiler. The ball being forced against its seat by the pressure of the steam prevents the return of the fluid; and as there is no induction valve to the pump, the water cannot be driven back into the supply cistern, which often happens in common pumps by that valve getting out of order.

As it may be objected that the piston of this pump acts against the atmosphere in its upstroke, it is proper to notice, that it was only suggested to supply the tubular boiler of a steam coach working under very great pressure: the power thus abstracted from the engine by the upstroke of the pump being less than $\frac{1}{200}$ part, was considered of far less importance than the insuring of a regular supply of water, for want of which boilers frequently become "*red hot.*"

IMPROVED SAFETY VALVES.

BY THE EDITOR.

Reflecting upon the numerous accidents that have occurred by the surfaces of safety valves adhering to their seats, and by

* We intended to have given, on a sufficiently large scale to be intelligible, a drawing of one of those parts of the roof where the top of a pillar and its bracket are united to the gutter, including the tie-rod, &c. but we have to regret, when too late to insert it, that it has been inadvertently omitted.

their want of capacity to allow the steam to escape so fast as it is sometimes generated, have induced us to propose the following modifications :—The first is sketched at fig. 2, Plate X., and is intended to represent at *a* an inverted metallic cup, whose edge is to be nicely turned, so that its periphery may lie in a true horizontal plane, upon a flat hard steel plate *b*, fixed to the top of the boiler *c*, a hole much larger than usual being made through the two latter, requiring, in consequence, a heavier weight, or a lever *f* of greater effect, to keep the cup to its seat. *g* is a box to receive, and *h* a pipe connected thereto to carry off the steam. At *i* is a sliding loop capable of being fixed at pleasure on any part of the lever *f*, by means of a finger and thumb-screw, to limit the range of the weight *e*, which is suspended to a little wheel that runs upon the upper edge of the lever. This part of the apparatus was devised from noticing a recommendation of Mr. Tredgold, in his Treatise on the Steam Engine, that it would be desirable if safety valves could be so constructed as to be relieved of a portion of their load when they are raised by the steam. That intelligent writer, however, having omitted to give any plan, the foregoing is submitted to the consideration of practical men as being calculated to effect that object by simple and efficient means; and although this method, as applied to land or fixed engines, may be found advantageous, they will immediately perceive its inapplicability to a steam boat, the lurching of which would prevent the weight from acting in the manner required. To obviate this difficulty, and apply the principle of relieving the valve of a portion of its load to a steam-boat boiler, we would suggest another arrangement even more simple than the former, and as it appears quite as effectual.

This mode is represented by the diagram, fig. 3, Pl. X. in which, in lieu of a horizontal lever is substituted an inclined one *l*, fixing the weight *m* on the upright portion, so that when the valve is lifted any given height by the pressure of the steam, the weight is in effect brought nearer to the fulcrum of the lever, as the forces act perpendicularly, in the manner represented by dotted lines in the figure. The other parts of this safety valve do not differ in principle to the former, but are merely an invertion of the two chief parts of the valve, in order that practical men may decide which merits the preference, for utility, or is easiest made; *n* is a tube fixed to the top of the boiler *o* (prepared in the manner of the cup in the other valve), and *p* the hard steel plate.

THE MANUFACTURE OF PATENT LEAD SHOT.

As some of our readers are probably unacquainted with the process of making the small lead shot used in fowling-pieces, we have considered a short paper on the subject as properly admissable into our columns. The process is, indeed, extremely simple and elegant;

and being productive of an article that may be deemed *perfect* in its construction, it is well deserving of a more particular notice than we have ever met with in print.

Previous to the invention of the patent process we are about to describe, the small shot were chiefly made by cutting sheet lead into little cubes, which were rounded by long continued friction against one another, produced by inclosing them in an iron barrel, which was made to rotate on its axis until the cubes were reduced into spheres. Another mode, considerably analogous to the present, was also in use, that of causing lead, and also lead combined with a small proportion of arsenic, to drop in a fluid state through a kind of sieve, (having perforations of a suitable size) into a vessel of water placed only a few inches beneath it. To prevent as much as possible the numerous imperfections resulting from this mode, a considerable degree of management and skill was required in the operator. The water, we understand, was covered with a thin film of oil, and the sieve with a stratum, an inch or more in depth, of the dross which forms on the surface of the melted metal; this dross or scoriæ acting as a filter to separate the metal into minute portions, as the latter was poured over it in successive portions, by ladling it from a contiguous caldron. It will readily be conceived that shot thus produced, however skilful the operator, must have possessed great variety in size and form, and that but a small proportion of a casting were at all adapted to the use of the sportsman. At length in 1782, one William Watt, a plumber and shot-maker of the city of Bristol, DREAMED that he was engaged in his usual employment of casting shot in the church tower of St. Mary (in the aforesaid city), and that the produce of his labour, which fell from a very great elevation into the water, was of a very superior description. Reflecting upon this manufacture of his imagination, he became of opinion that a better process could not be contrived, and he was permitted to make a real trial of it in the identical site of his dream, the lofty tower of St. Mary; the experiment was as successful as the most ardent theorist could expect, the globules of metal becoming hard by the cooling influence of their descent through the air, so as not to be injured in their figure by subsequent concussion against the surface of the water into which they fell. Mr. William Watt had besides made some improvement, it is supposed, in the preparation of the alloy used; but whether he dreamed this also we have not been informed: certain it is, that he took out a *patent* for his dream; and we are told upon good authority, that he afterwards *turned his lead into gold*, by selling his patent-right for the sum of thirty-six thousand pounds. The specification of this patent is inserted in the third volume of (that truly valuable record of mechanical and scientific discovery) *the Repertory of Arts*, which we will here annex for the convenience of our readers, because it contains the exact process that is now adopted and has been uniformly practised, without essential variation, in all the shot manufactories working under this patent; which patent has superseded all other processes, and has seemingly left nothing for inventors to devise as an improvement, although the term of the patent-right expired no less than thirty-four years ago.

Specification of the patent granted to William Watt, *of the city of Bristol, Plumber and Shot Maker, for his invention for making small shot solid throughout, without the imperfections which other shot usually have on their surface.*—Dated September 10, 1782.

"To all to whom these presents shall come, &c. &c.—*Now know ye,* that in compliance with the said proviso, I, the said William Watt, do hereby declare, that my said invention of making small shot solid throughout, perfectly globular in form, and without the dimples, scratches and imperfections which other shot, heretofore manufactured, usually have on their surface, is performed in the manner following, (that is to say) :—

"Take twenty-hundred weight of soft pig lead (more or less, according to the slag or poisoned lead, intended to be made), melt it in an iron-pot; then take about a peck of coal ashes, or dirt, strew the same round the edge of the pot, upon the surface of the metal, leaving the middle of the metal naked; put it upon the metal which is uncovered with the ashes, or dirt, about forty-pounds weight of white or yellow arsenic; then cover the pot with an iron cover, and close the edges of the cover, all round the pot, with mortar, clay, or dirt, to prevent the arsenic from evaporating; keep a good fire under the pot for three or four hours, so as to have the lead red hot, that the arsenic may be mixed with the lead, and the lead thereby fully poisoned; then take off the cover, and skim the metal; then lade it off into moulds or sand, to cool in bars or ingots, and which when cool is called slag or poisoned lead. Then take another twenty hundred weight of soft pig-lead (according to the quantity of shot intended to be made), melt the same in an iron pot; then take about three quarters of a hundred weight of scum from clean pig lead, put it into the pot, and let the same melt; when melted put in one of the bars or ingots of slag, or poisoned lead; and when melted, with a small ladle, take some of the metal out of the pot, and drop it in water from the height of about two feet; if the shot be not round, put in more of the slag or poisoned lead, till you find it drops round; then skim the metal, and put the scum into an iron or copper frame, full of holes, according to the size of the shot intended to be made; squeeze the scum, while soft in the frame, with the ladle with which it was taken out of the pot; then take the metal out of the pot, and pour it into the frame, over the surface of the scum, and let it drop through the frame into water. If for the smallest shot, the frame must be at least ten feet above the water, and for the largest shot, about one hundred and fifty feet, or more, above the water, and so in proportion, according to the size of the shot intended to be made. In witness whereof, &c."

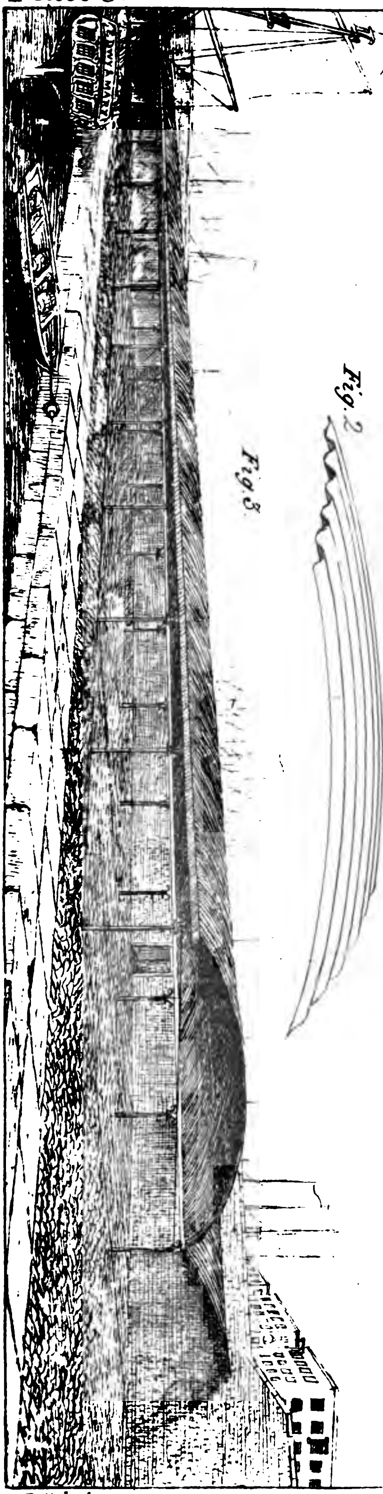
Our readers will observe that this specification, like the majority of those of the present day, is, in a legal point of view, and to the scandal of our patent law, not worth a straw; as much of the first described part of the process was previously known and commonly used, while the claim embraces the whole. This remark, as applied to the present case, is rendered needless by the lapse of time; we

make it merely in passing, as a caution to future patentees to be circumspect in the selection of competent persons to execute such documents. Had the honourable men who purchased William Watt's patent right, been disposed to take advantage of the defectiveness of the specification, they might have used the dreamer's process without paying him one farthing, instead of £36,000, and his golden dream would thus have proved but lead at last.

The kind of building used for the manufacture is represented by fig. 1, Pl. IX.; it is a vertical section of the smallest shot tower belonging to Messrs. Walkers, Maltby, & Co. on the south bank of the Thames, London; its height is about 150 feet, affording a fall of about 130 for the shot. The alloy there used, consists, as mentioned in the specification, of 40lbs arsenic to a ton of lead, is prepared and cast into pigs of about 1½ cwt. each, to be ready for use as required. By means of a suitable tackle and chain (a part only of which, to prevent confusion in the drawing, is brought into view at *a a*), ten of such pigs are drawn up through a trap door into the melting room at the top of the tower. Here the pigs are successively put into the caldron *b*, which is heated by a common furnace *c* beneath, having a brick-flue and chimney, terminated by an iron funnel reaching to the top of the upper dome or lantern. When the alloy is melted and the scoriæ properly formed, a portion of the latter is ladled by the melter into a kind of square cullender *d*, supported in an iron frame fixed close to the furnace; this vessel is 12 or 14 inches square, and about 3 inches deep; it has a handle like a frying-pan, and its bottom is perforated with circular holes of a size suited to the shot about to be made. The quantity of dross required being determined by the experiment of making a few shot (which are not suffered to descend below the floor of the melting room); a man now ladles the fluid metal out of the caldron into the perforated vessel; in running through which it is somewhat detained and cooled in passing the scoriæ, which tends to separate it in small portions, where it collects underneath the cullender at every hole in small globules, which instantly drop, and are followed by other globules in such rapid succession as to appear at a little distance like a pouring rain of liquid silver. This metallic shower is represented in the drawing *e e e*, and falls into a large tub of water *f* placed underneath. From the great specific gravity of the shot they do not scatter in their descent, and the workmen cross the bottom floor of the tower, as their business requires, in perfect security.*

The tower is quadrangular, and has 4 or 5 windows on each side, represented at *g g*; *h h* represent doorways, the upper one leading into an external gallery *i i*; which, as may be supposed, commands an extensive and highly interesting view of London and its suburbs;

* A terrific accident however occurred when the identical iron pot *b* was raised to the top of the building. It had been drawn up to the top floor, when upon landing it the tackle by some mismanagement slipped, and the vessel weighing 15 cwt. fell to the bottom of the tower, destroying the wooden floor, joists, and four massive cast-iron beams, but happily without injuring any individual person.



Shed recently built at the London Docks with W. H. Palmer's Patent Roofing.

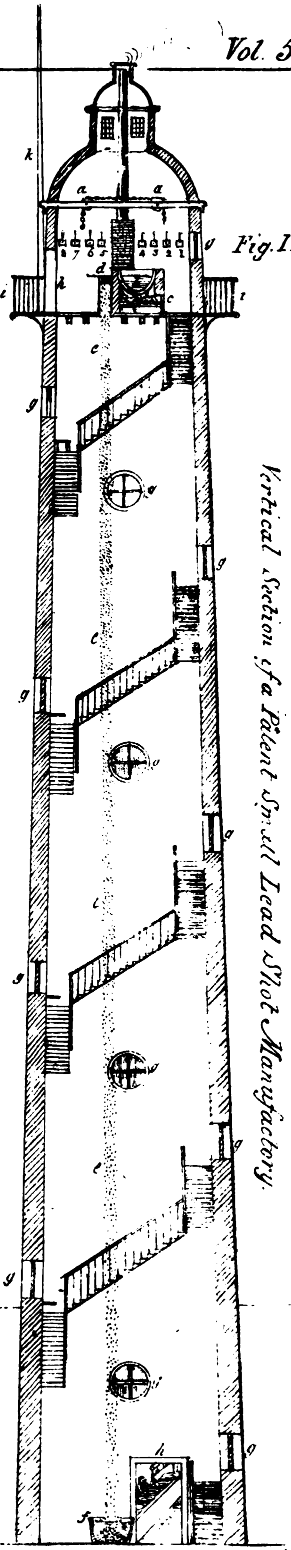


Fig. 1.

Vertical Section of a Patent Small Lead Shot Manufactory.

L. Hebert

Co. 1850

k, a long flag staff, which extends beyond the limits of the paper. The stair-case from the bottom to the top of the tower is of iron, and of great stability; it is represented of course as dissected in the drawing, the foot plates are of cast iron, slightly fluted, to prevent slipping; in which case the fall would, probably, not be severe, as the inclination is not steep, and there are square landing places at each corner of the quadrangle, as well as seats for the convenience of the weary, or the lazy ascendants and descendants.

The various sizes of the shot are distinguished by the manufacturers by the Nos. 1 to 12; the largest, No. 1, are called Swan shot; the smallest, No. 12, dust shot; their diameter varying from 1-30th to 1-4th of an inch. The shot, when removed out of the tub, are dried by artificial heat, as they remain considerably wet, by the water being held between the little spheres by capillary attraction. To dry them they are scattered over a large heated iron-plate, having a furnace beneath, on which they are well stirred about, and swept off as soon as dry. After this operation they present a dead white silvery appearance; they contain amongst them many (though but a small proportion) of imperfect shot, and the perfect differ somewhat in size; to separate these varieties from one another constitutes the next process. The dried shot are therefore taken to the sifters, who have each the management of a series of three or four sieves placed in a row, in a reciprocating iron frame, which derives its motion from a steam-engine. The movement is effected by a horizontal revolving shaft (near the ceiling of the room), having at the extremity a short crank, from which depends a rod, that is made to rise up and down; this vertical rod is attached at its lower extremity to a lever of the common bell-crank kind, which is connected to the frame containing the sieves, and therefore produces in the latter a reciprocating horizontal motion. Each sieve is also provided with a distinct frame, embracing its circumference, with a large joint on one side which connects it to the general frame. A quantity of the shot being thrown into the first sieve, that portion of them which is small enough passes through its meshes, the rest that are too large are then discharged into the next sieve, by *turning over* the first on its hinge joint, as a person would open and throw back the lid of a box. The advantage of this arrangement will be evident, when it is considered that the sieves, being constantly in rapid motion, it would be no easy matter to throw the shot from one into the other, were they separate without spilling; whereas by their connection, the shot cannot be discharged otherwise than as intended. The attendant to the sifting apparatus has therefore only to supply the first sieve, and to discharge the contents from one to the other successively. The produce of the two first sieves is collected into separate bins, and as these contain many shot of imperfect *forms*, they are taken thence to another set of operators, who separate the bad from the good, by a process equally simple and effectual. Those which have not passed through the two first sieves of the series, are condemned as bad, and are remelted.

A number of shallow quadrangular trays, the figure of which

may be defined by the boundary line of a plane produced by the longitudinal section of the frustrum of a cone in the line of its axis, made of hard wood and perfectly smooth at the bottom, are suspended from the ceiling by cords attached to the two corners of the widest ends of the trays, their other or narrowest ends resting upon the edges of a row of shot bins. Thus arranged, a boy, who manages two of these trays, throws upon each at the widest end, (that nearest to him) a small measure full of shot; he then takes hold of the trays, and giving them a gentle vibrating motion laterally, and at the same time raising the ends a little to give them a slight inclination, the shot roll about tending from side to side, those that are perfectly spherical making their way quickly off the boards into the bin at the extremity; while those that are imperfect are detained by their comparatively sluggish movements, and being thus separated from the good, the trays are pushed forwards about a foot, and their contents emptied into other bins placed beyond those containing the good shot as before mentioned. This operation is so effectual that it is difficult to pick an imperfect shot out of those that come to market. Four or five boys thus employed, with two trays to each, suffice for a manufactory of the kind we have described, which makes about five tons per day; the smallest shot require the utmost care and gentlest management of the inclined plane, therefore the eldest or steadiest hands are selected to operate upon them. The next and last part of the business previous to the shot being bagged for the market, is to polish them; for this purpose a cast iron barrel, holding perhaps half a ton weight, is nearly filled with them, and a rotary movement communicated to it by the engine, which causes all the little spheres to rub against each other, and give them a black lustre, materially differing from their previous argentine complexion.

It is worthy of remark, that a curious effect is produced upon the interior of the cast iron barrel by the friction of the shot, that of wearing it into a regular series of grooves, so that a stranger would suppose the barrel had been cast with an internal fluting

LIST OF NEW PATENTS SEALED.

AXLETREES.—To W. Mason, of Margaret Street, Cavendish Square, for improvements in axletrees and their boxes.—Dated 24th August, 1830.—Specification to be enrolled in six months.

PAPER-MAKING.—To T. Barratt, of St. Mary Cray, Kent, for improvements on machinery for making paper.—31st August, 1830.—Six months.

PRINTING.—To A. Applegath, of Crayford, Kent, Printer, for improvements in printing machines.—31st August, 1830.—Six months.

RAILWAYS.—To W. Losh, of Benton House, Northumberland, for improvements in wheels for railway carriages—31st Aug. 1830.—Six months.

MOWING.—To E. Budding, of Stroud, Gloucestershire, for machinery for the purpose of cropping or shearing grass plats, &c., being a substitute for the scythe.—31st August, 1830.—Two months.

BREAD.—E. Clayton, of Nottingham, for an improved mode of manufacturing dough for baking into bread.—31st August, 1830.—Two months.

SADDLE.—To T. Thacher, of Birmingham, for an elastic self-adapting saddle.—7th September, 1830.—Six months.

[The remainder of the new Patents in our next.]

PATENTS ENROLLED BETWEEN 20TH SEPTEMBER AND 10TH OCTOBER, 1830.

Particularizing the Offices in which the Specifications may be inspected, with the Dates of Enrolment.

WINDOWS.—To Thomas Prosser, of Worcester, architect, a patent for "certain improvements in the construction of window sashes, and in the mode of hanging the same," was granted on the 6th of March, and the specification was deposited in the Rolls' Chapel Office on the 6th of September, 1830.

Mr. Prosser proposes in this specification to attach the upper and lower sashes to the same lines which pass over a pulley attached to each side of the frame near the top of the window. These are of the kind usually called side pulleys, which have their axes at right angles to the surfaces to which they are attached. The small frames in which the pulleys turn are moveable in dovetailed grooves in the window-frames, and adjustable by a screw to regulate the tension of the sash-lines. The two sashes are thus made to balance each other, entirely obviating the necessity for the metallic counterpoises usually employed to facilitate the raising and lowering of the sashes. From this description, it will be perceived that one of the sashes cannot be moved without moving the other, so that the opening can never be made entirely either at the top or bottom of the window, but an equal portion of it will be at each. The method of attaching the lines to the sashes consists in tying neatly to the ends of the lines small pieces of metal, with longitudinal rectangular slits, which pass over T studs fixed into the sashes with their heads across, by which the lines are secured from being accidentally detached when once they are hooked on. Instead of the beads, which are generally fixed to the frame on each side of a window-sash as guides to keep it in its place while stationary, and to preserve their perpendicular position while elevated or depressed, this patentee fixes a single rod into the frame, which fits accurately into a groove in the side of the sash. This constitutes a fitting less pervious to the weather than that usually adopted, at the same time that it affords great facility in cleaning the windows; for, as the guide-rod of the lower sash does not extend more than half way down, so that the lower sash being elevated to the top of the window escapes its guide-rod, and may be turned inside out, and the upper sash being lowered to the bottom may be similarly reversed, and by this means all parts of the window can be brought

within reach of a person in the room for the purpose of cleaning or repairing.

The improvements here contemplated seem to be all good; but we consider the last mentioned will be extensively adopted, and become very useful; for the present method of cleaning the outsides of high windows is attended with much danger and inconvenience, or with much injury to the fittings by the frequent removal of the side beadings.

PEPPER PREPARING.—To John Alexander Fulton, of Lawrence Pountney Lane, London, merchant, a patent for "an improvement in the preparation of pepper," was granted on the 20th of March, and the specification was deposited in the Enrolment Office on the 15th of September, 1830.

This patentee's claim seems to be in the inverse ratio of his invention, for he has invented, as he states, the application of a common grit or barley-mill to the cleansing of pepper from husks, and he claims the exclusive right to use all sorts of machinery in preparing pepper.

SAILS.—To William and Andrew Ramsay, and Matthew Orr, Sail Makers, of Greenock, Scotland, a patent for "an improvement in the manufacture of canvass and sail-cloth, for the making of sails," was granted on the 20th of March, and the specification was enrolled in the Enrolment Office, on the 20th of September, 1830.

The improvements contemplated by these patentees consists, in a method of making sail-cloth or canvass, with the yarn constituting the weft in an oblique position, instead of crossing the yarn constituting the warp at right angles, according to the usual manufacture. To effect this the working parts of the loom, such as the batton frame and batton, the lames, the reed, &c. are made to shift upon the side frames to any required angle, and arrange so as to be secured by clamping or screwing, to preserve the necessary position during the weaving of any one piece of the canvass. The slits of the reed must be placed at the same angle with respect to its frame as the frame itself makes with the side frames of the loom, that the reed may move freely between the threads constituting the warp.

It will be perceived, that these modifications are equally applicable to the hand and power loom.

The advantages which canvass manufactured in this way

possesses over that manufactured from yarn of the same quality with the weft crossing the warp at right angles, is, a greater degree of strength when the principal tension or strain upon the sail is made to coincide with the direction of the threads of the warp or weft, and this can always be done with sail-cloth manufactured as above described, for the sails are strained by application of force to the corners. This circumstance, must however, be attended to by the sail maker as well as by the canvass manufacturer.

Cooking Apparatus.—To W. E. Cochrane, of Regent Street, London, Esq. a patent for "an improvement or improvements on his patent cooking apparatus," was granted on the 20th of March, and the specification was deposited in the Enrolment Office on the 20th of September, 1830.

Mr. Cochrane had previously obtained patents for a portable steam cooking apparatus and a portable oven, and his present invention is for a combination of the two in the same apparatus, by which arrangement, greater portability, with economy of fuel is obtained.

The cooking and baking are effected by the heat of a lamp, of the argand principle, over which is placed a cylindrical vessel with a moveable cover, and this vessel constitutes the oven for baking or other purposes requiring dry heat. Around this cylindrical oven, is placed an annular boiler made of two cylinders joined at their upper and lower ends. The interior of the cylinder is made so wide as to leave a space between it and the oven for the flame of the lamp to ply; and this hole is covered at the top by a circular flanch.

The boiler is to be only partially filled with water, leaving a space in the upper part for steam. From this proceed a series of pipes and stop cocks for the conveyance of steam into kettles, such as are usually employed for cooking victuals by steam. There is much ingenuity displayed in the arrangement of this apparatus, as it will be perceived, that almost every species of cooking can be carried on at the same time by the heat from a single lamp.

Windlasses.—To George Scott, of Water Lane, London, Engineer, a patent for "certain improvements on, or additions to, windlasses and relative machinery, applicable to naval purposes," was granted on the 20th of March, and the specification was deposited in the Enrolment Office on the 20th of September, 1830.

It has been found that ships riding at anchor have sometimes snapped their cables by the sudden jerks to which they are subjected from the motion of the vessel caused by the action of the wind and waves. To prevent such accidents, Mr. Scott proposes to employ springs in connection with the attachments of the cables to the vessel, and for this purpose he described three plans. Instead of fixing to the deck the triangular bits which support the windlass, he makes them to oscillate on fixed pivots, the two bits being made of cast-iron and strongly framed together, to prevent the friction arising from their twisting when the cable is applied near one end of the windlass.

These bits, represented by *a a*, fig. 2, Pl. XI., are made to oscillate on the pivot *b*. Recesses are made on the forepart of the triangular bit *s* to contain a series of grasshopper-springs *c c*, which keep the windlass up to its place, except in cases of sudden jerks, when the spring will give way a little, and save the chain or other cable from being snapped.

As additional security against accidents of this kind, Mr. Scott proposes to pass the cable through a spring box, as represented at *d*, which consists of two cylinders arranged to move the one within the other, with a space between them for the reception of one or more spiral springs to be fixed at one end to the interior and at the other end to the exterior cylinder. The exterior cylinder is connected by two chains, represented at *e e*, to the windlass bits; and the interior cylinder is furnished with a pall at *f*, (see fig. 3, which gives a section of the spring box,) jointed to the upper side, and which falls upon, and presses the links of the chain against a projection fixed on the under side of the cylinder: thus permitting the cable to be drawn through the cylinder towards the windlass, but not to return, except when the pall is lifted up for the purpose of letting down the anchor. From this arrangement it will be perceived, that when the cable is released from the barrel of the windlass it will be held by the chains attached to the bits through the instrumentality of the spring box at *d*. It is stated that the spring box *d* may be also made of a square form to contain a series of grasshopper-springs of several hundred leaves instead of the spiral springs above described.

Mr. Scott's plan of applying grasshopper springs to the supports of the windlass is new, and it will no doubt answer well if attention is paid to manufacture the various parts of the appropriate strength. He seems, however, to be ignorant of the existence of a patent by Mr. Burnett for the application of spiral springs to cables as well as to many parts of a ship's rigging.

Plating with Silver.—To Samuel Roberts, of Park Grange, near Sheffield. Yorkshire, Silver Plater, a patent for "certain improvements in plating or coating of copper or brass, or mixture of the same, with other metal or materials, or with two metals or substances upon each other; as also a method of making such kinds of articles or utensils with the said metal when so plated has have hitherto been made either entirely of silver, or of copper or brass, or of a mixture of copper and brass, plated or coated with silver solely," was granted on the 26th of July, and the specification was deposited in the Enrolment Office, on the 20th of September, 1830.

The improvements invented by this patentee consists, in introducing a layer of white metal, as that mixture of zinc, nicol, and copper, denominated "*German silver*," between the metal to be plated and the silver with which it is plated. The advantage of this invention is, that when the silver wears off in parts the defects are not readily perceived, as the under metal is very nearly of the same colour. The German silver is to be applied by a process precisely similar to that usually adopted in plating, and after the real silver is be applied to the compound metal, which is to be moulded into form either before or after the process of plating, as circumstances may require.

Fermented Liquors.—To William Aitkin, Esq. of Carron Vale, Scotland, a patent for "certain improvements in the means of keeping or preserving beer, ale, and other fermented liquors," was granted on the 30th of March, and the specification was deposited in the Enrolment Office on the 24th of September, 1830.

It has been long the practice to keep the fermented liquors either in casks or glass bottles closely stopped, to prevent the escape of the carbonic acid gas, by which liquors would become flat. The preference being given to the plan of keeping it in small bottles, as far as regards the quality of the ale, beer, &c. for this enables the consumer to prevent any being exposed to the atmosphere except the quantity which he may require for use at any one time. But this plan has been found too expensive for general introduction.

Now to unite the advantages of the bottles with the economy of the barrels is the object of Mr. Aitkin's patent, and he proposes several methods of carrying the object into effect; in all of which he preserves the liquor under pressure to prevent the escape of the carbonic gas. One plan is to make the barrel cylindrical,

with an air-tight piston moveable within it; that in may be forced down upon the surface of the beer, by a screw or otherwise, whenever a quantity is abstracted for use. Another method is to introduce within the cask, which may be made of the usual form, a kind of elastic bag or vessel, of sufficient capacity to fill the cask. This bag must be made of materials impervions to air and moisture; and as the beer is withdrawn the bag is expanded to occupy the place, by injecting air or water: and thus an uniform pressure is preserved upon the beer as long as any remains in the cask.

DISTILLATION.—To Daniel Towers Shears, of Bankside, in the borough of Southwark, Coppersmith, a patent for "certain addition to, and improvements in, the apparatus used in distilling, and also in the process of distilling and rectifying," was granted on the 31st of March, and the specification was lodged in the Enrolment Office on the 29th of September, 1830.

The improvements proposed by Mr. Shears apply to a distilling apparatus patented by Mr. Corty in January, 1818. The general arrangement of the still and accompanying apparatus is represented by fig. 1, Pl. XI., where *a* shows the still, *b*, a wide cylindrical opening communicating with a vessel *c* placed over it: near the top of *c* is a water vessel *d*, flat at the bottom, and convex externally at the top. This vessel, which is of less diameter than *c*, that the vapour may pass round it, partially condenses, by the cold water which it contains, the aqueous portion contained in the vapour as it impinges against its flat bottom, passes a broad rim *e* and along the upper surface, as shown by the direction of the arrows. The condensed aqueous vapour will of course descend again into the still, and that portion which may escape condensation will of course pass into the vessel *f*; where it will come in contact with another water vessel *d'*, where a farther condensation of the aqueous vapour takes place, and the remainder passes with the spirituous vapour into *g*, and gets condensed by a third water vessel *d''*: this rectifications is carried on at the same time with the distillation.

The pipe which supplied the vessel *d d' d''* with water is represented at *h*; and the water in *d''* as it becomes heated, rises by its superior levity, and passes by the pipe *i'* into the vessel *d'* by the pipe *i* from *d'* to *d*; whence it passes off by the pipe *k*, and after taking several coils near the bottom of the wash tub *l*, for the purpose of communicating heat to the wash previously to its pass-

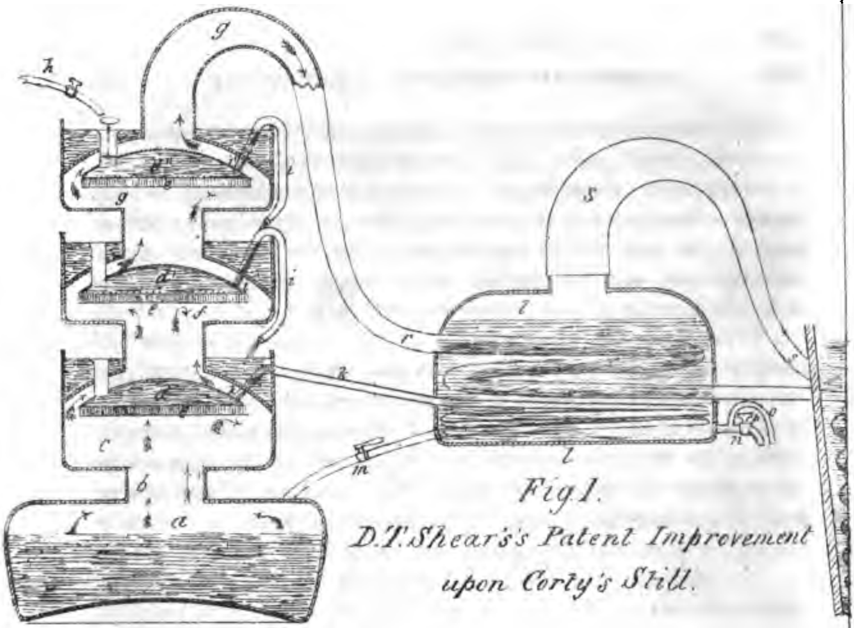


Fig. 1.

D. T. Shears's Patent Improvement upon Corty's Still.

Scott's Patent Ship's Windlass.

Fig. 2.

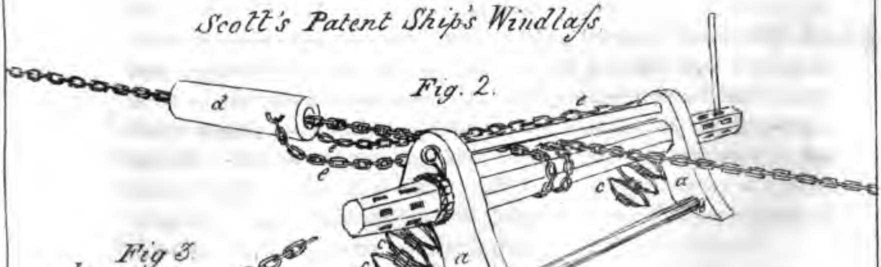
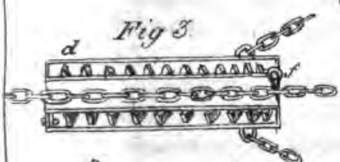


Fig 3.



Street's Patent Steam Engine.

Fig 4.

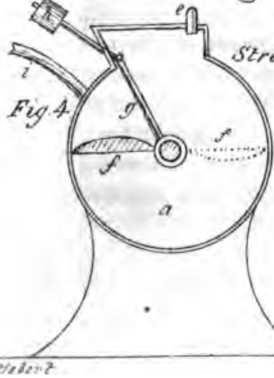
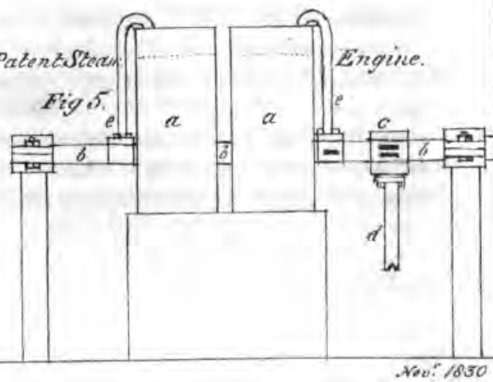


Fig 5.



ing into the still by the pipe *m*. The water then escapes by the pipe *n*, passing over the bend *o*, which being higher than any part of the coil keeps it constantly full of water, except when it is wished to clear it out, when the cock *p* is to be opened. Sometimes, instead of coiling the water pipe in the wash tub, a false metallic bottom is introduced into the tub, and the space between the bottoms being filled with hot water, heat is communicated to the wash in that way. We shall now trace the progress of the spirituous vapour which passes by the swan neck *g* and pipe *r*, which in its progress to a worm-tub or condenser of the usual description, takes several coils in the wash-tub just over the coils of of the water pipe; and by the two, a constant supply of hot wash is obtained for the still. Any vapour which may be evolved in the wash-tub is either carried off by the pipe *s*, and condensed by a separate coil of pipe in the worm-tub, or it is conducted by the pipes represented by the dotted lines, back into the still.

This still, as our readers will perceive, is another ingenious modification of Woulfe's apparatus. At first sight it appears to resemble St. Marc's still, described in No. 76 of our first series; but it differs from the latter, inasmuch that the product of the condensations that are continually going forward return into the first copper; whereas, in St. Marc's, they enter into fresh portions of the wash contained in coppers placed successively one above another, the contents of which are distilled by the ascending vapour. In this apparatus *water* is used for condensation in the upper vessels, and that water subsequently carried to the wash vessel *l*. This variation from St. Marc's appears to be necessary to avoid the patent-right of the latter.

Rotary Engine.—To John Sheet, of Clifton, Gloucestershire, Esq. a patent for "a new mode of obtaining a rotary motion by water, steam, or gas, or other vapour; being applicable also to the giving of blasts to furnaces, forges, and other purposes where a constant blast is required," was granted on the 5th of August, and the specification was enrolled in the Petty Bag Office on the 1st of October, 1830.

Although the variety of steam engines, or rather of designs for steam engines of the rotatory principle, which have been at different times described in the Register of Arts, &c. is very extensive, and displays, as our readers are aware, much ingenuity and almost every conceivable modification of form; yet the one before us has an important peculiarity which well deserves the attention of scientific men.

Mr. Sheet proposes to place upon the same axis two cylinders, so arranged with respect to the steam passages, that the communication between the boiler and the cylinder is opened to the one while it is closed to the other, and thus the action on the axis is kept up by one of the cylinders during the time that a piston or fan, which is attached to the axis, passes a steam stop, which is made to fold back in a recess in the upper part of the cylinder.

The admission of the steam into the cylinder is by means of a hollow axis which turns within them, and through the medium of which, the power is to be communicated to any required purpose. A steam pipe, from the boiler, terminates in a box through which the hollow axis passes, being rendered steam tight by packing on each side. Several longitudinal openings are made into that part of the axis which is within the box. The area of these openings being made equal to the interior area of the steam pipe. By this means the hollow axis becomes charged wiih steam, which passes from hence into the cylinders by two pipes in connection with two other steam boxes which fit steam-tight where there are openings on opposite sides of the axis, that the communication is always open to one of the cylinders while it is shut off from the other. The cylinders are both fixed on firm stands, and there is placed within each a rectangular piston or fan, which is to be fixed on one edge to the axis, and packed so as to work steam-tight against the periphery and ends of the cylinder. As a steam stop, a rectangular piece is jointed to the upper part of the cylinder and turns back into a recess while the piston passes it. One of the pivots on which the steam stop turn, passes through a stuffing box, and has attached to it a lever, with a weight to constitute a counterpoise to the steam stop; or the recess into which the steam stop turns is made large enough to admit of a counterpoise being applied within the steam-tight cylinder. The steam stop is made to fall into the position of its action either by its own gravity, or else it is actuated by exterior cams or excentrics.

The reader will more readily comprehend the arrangements of this engine by inspecting the diagram, figs. 4 & 5, Pl. XI., where *a a* represents the two cylinders; *b b*, the hollow axis receiving steam by the openings, and steam box *c* in connection with the pipe *d*. The steam passes alternately by the pipe *e e* into the cylinders. *f f* shows the piston fixed on opposite sides of the axis that one may be always action; *g* the steam stop, and *h* its counterpoise. *i* is a pipe for the escape of the steam to the condenser, or elsewhere, after it has performed its work. Mr. Steel proposes

another method of admitting the steam into the cylinders, which he states may be sometimes employed with advantage: it consists of two valves attached to the extremities of a lever turning upon a fulcrum at its middle, by which one of the valves is opened upwards and the other downwards at the same time. These valves with their seats are included in an enlarged part of the steam passage, and they are actuated by a lever, the extremity of which rests upon the periphery of a wheel, and by dropping into a notch on one side of the wheel the valves are opened.

Although we have described this as being actuated only by steam, gas, water, or other fluid, may be employed for the same purpose: and by altering the modification a little and reversing the operation, the apparatus may be used as a pump for raising water, or as a machine for supplying air to furnaces.

GAS.—To James Collier, of Newman Street, Oxford Street, Civil Engineer, and Henry Pinkus, of Thayer Street, Manchester Square, London, Esq. a patent for "an improved method and apparatus for generating gas for illuminators," was granted on the 5th of April, and the specification was lodged in the Rolls Chapel Office on the 4th of October, 1830.

It has been found that the retorts used in the manufacture of gas from resin, or other bituminous substances, have been very soon rendered useless by the action of the ingredients employed; and to remedy this, the above patentees propose to introduce with the resin a small proportion of sugar, molasses, or similar subtances, to neutralize the injurious effects alluded to.

The patentees likewise propose to force into the retorts a small quantity of pure hydrogen, to combine with the carbon, and increase the quantity of gas obtained from the bituminous matter.

A method of regulating the supply of resin to the retorts, according to the quantity of gas consumed, is next detailed; which is in principle, and almost in detail, the same as the method recently patented by Mr. Cowper, of Brixton, Surrey, and described in the present volume of the *Register of Arts*, &c.

HOP POLE DRAWER.—To John Knowles, of Farnham, Surry, hop planter, for "a certain instrument or machine for drawing up hop poles out of the ground previous to picking the hops; and which by drawing the poles perpendicularly, will greatly save them, as well as prevent the hops from being bruised; called a *hop-pole-drawer by lever and fulcrum*," was granted on the

13th of August, and the specification was deposited in the Rolls Chapel on the 4th of October, 1830.

The intention of this patentee is very clearly detailed in the above title; and the nature of his invention, which is a very clever one, will be at once understood by an inspection of fig. 6, and Pl. XII. showing a portion of a hop-pole, and the application of the lever and fulcrum in raising it out of the ground. *a a* is the pole, and *b* the lever; *c* its fulcrum, which has rather a broad base with a short spike, to prevent its slipping when the pressure is applied to it. Fig. 5 shows a plan of the lever with its iron jaws, which are made to approach each other, that some part of the opening may fit all sizes of poles; and they are serrated to prevent them from slipping upon the poles.

The usual way of extracting hop poles by pushing them backwards and forwards till they are sufficiently loosened to be raised out of the ground by hand, subjects the hops to injury, by shaking and bruising them, while the poles themselves are frequently broken. These inconveniencies are avoided, and considerable time is saved, by the application of this patent apparatus, which is sufficiently portable to be removed with facility from one pole to another.

Gun Locks.—To Samuel Smith, of Princes Street, Leicester Fields, London, gun-maker, a patent for "a new nipple or touch-hole to be applied to fire-arms, for the purpose of firing the same by percussion; and a new cap or primer for containing the priming by which such fire-arms are to be fired," was granted on the 7th of August, and the specification was lodged in the Rolls Chapel Office on the 5th of October, 1830.

Mr. Samuel Smith's new nipples or touch-hole, as well as his new percussion cap, are shown by fig. 3, Plate XII. The invention consists in reducing the size of the space for the reception of the percussion priming without weakening the nipple. This he effects by a very small elevation in the centre of the nipple, and a corresponding recess for the priming in the centre of the cap. And thus the nipple may be considerably strengthened by enlargement without requiring additional priming.

DESCRIPTION OF AN APPARATUS

INTENDED AS A SUBSTITUTE FOR A PUMP FOR RAISING WATER, SYRUP, AND OTHER LIQUIDS, BY THE USE OF STEAM.

(Translated from the *Recueil Industriel Julliet*, 1830.)

THIS apparatus has been used by M. Dubrunfaut for raising the juice of the red-beet, and boiling syrup, from a cellar into the first floor of a house.

Fig. 1, Pl. XII. exhibits a vertical section taken in the middle of the apparatus, and fig. 2 a plan (or view from above) of the same.

A. is a cylinder made of sheet iron, closed by a tight under locking cover B, (*couvercle autoclare* B.")

C. a pipe by which the cold liquid is raised into the apparatus; it is furnished with a cock.

D. a pipe for discharging the liquid contained in the vessel A; it is provided with a cock of the same bore as the pipe C.

E. a little tube furnished with a cock which admits the steam.

F. another small tube provided with a cock for conducting the liquid from the wooden reservoir G into the vessel A.

I. a disc of wood.

J. a perforated nozzle at the end of the tube F in the interior of the vessel A.

Mode of action, supposing the apparatus to be employed in raising the juice of the beet.

The tube C should be plunged to the bottom of the reservoir of juice, which should not be more than from 20 to 25 feet below the point H; the tube D should open above the defecating caldron.

The reservoir G is charged with cold juice, then the cocks F and C being shut, the cocks D and E are to be opened; the steam supposed to be at a pressure of 1½ or two atmospheres enters the cylinders, expelling the air by the tube D; and when it begins to go out with some force by this tube D, one may be certain that the vessel is freed from air; then the cocks E and D are to be shut, and the cock F opened. If the steam in the cylinder should have less than an atmosphere of pressure, the equilibrium is restored by the pressure of the liquid by the tube F. When the equilibrium is established, the juice in the vat G immediately rises in the tube F, then falls in a shower in the cylinder A, where it produces a condensation of the steam. When half a pail or a pail-full of the juice has thus passed, the cock F is to be shut, and the cock C immediately opened. The juice will then rise and entirely fill the cylinder. One may be certain that the juice rises by feeling the tube C, near the part H, which is hot before the ascent of the juice, but becomes cool when it has risen.

When the cylinder is charged with juice, which one may ascertain by the coldness of its sides, the cock C is to be shut, and the cocks D and E opened. Fresh steam being introduced, its expansive force presses upon the liquid, and drives it by the tube D into the caldron. When the steam goes out by the tube D, it

shows that the cylinder is full, and that it is ready to receive a fresh charge, by the process which we shall now describe.

The condensation or force of the vapour which presses upon the juice to raise it, is very weak, because it is only equal to the temperature of the sides of the vessel, and at the surface of the liquid, which is partly owing to the small diameter of the vessel; besides, the wooden disk I helps to keep the liquid from coming in contact with the steam.

The vat G is supplied with cold juice, which is drawn from the same caldron.

The apparatus as herein described, is only another application of a more ingenious machine, invented by M. Maneury d'Ectot, for raising water in the slaughter-house of Grenelle.

It may be easily applied to raise hot liquids, syrups, and also the concentrated syrup (sirop cuit); but then we can only avail ourselves of the expansive force of the vapour. In this case, the boiling liquid must be made to enter the cylinder simply by its own gravity, by a tube opening at H, whilst the air passes out by a snifting valve, which should now be in the tube F. The tube D still serves to raise the liquid to a height according to the density of the syrup, and the degree of elasticity of the steam. Thus a boiler at low pressure, working with two effective atmospheres will raise the concentrated syrup about 23 feet high.

The apparatuses usually employed for heating by steam, are nothing else than machines of this kind.

Thus, admitting that the tube C communicates with the tubes which deliver the condensed water, this water can be returned into the cylinder A, whilst the air, and excess of steam, if there be any, escapes by the tube F. The tube D communicates with the water of the generators, the cylinder A being placed above them. The tube E communicates with the atmospheres of the generators. Thus, supposing the cylinder to be full of water, which it is desired to pass into the generators, it is only necessary to open the cocks D and E after having shut C and F. The steam of the generators is then placed in equilibrium with the atmospheres in the vessel A, and the water falls into the generators by its own gravity.

If it be now wished to replace the loss of water, and to convey into the generators the cold water, it is only necessary to have a tube like that of C, communicating with a back of cold water, which may be made to ascend into the cylinder, as the cold juice, and thence be passed into the generators by the tube D, as we have already explained.

This apparatus (the writer concludes) is more convenient and more certain in its action than pumps, considered as a water circulator ("comme retour d'eau") it is less subject to derangement, and requires less repairs; it has besides, the advantage of operating with boiling water. Considered as a juice raiser ("monte-jus"), or as a syrup raiser ("monte-sirope"), it possesses the advantage of avoiding the friction to which pumps are subjected, which is said to be prejudicial to the quality of the products.

ON THE CAUSES AND PREVENTION OF THE BURSTING OF STEAM-ENGINE BOILERS.

[*In our last number we inserted a copy of a circular letter addressed to us by the Secretary of the Franklin Institute of Philadelphia, appointed for the purpose of inquiring into the above-mentioned important subject. At the period of our publishing that circular, we had nearly completed an answer to it, furnishing such information as we were enabled to afford, and suggesting some variation in the safety apparatus; the latter we gave in a separate article at page* 142, *and we now add the whole remainder of that letter, presuming that the* SUBJECT *of it is as interesting here as at the other side of the Atlantic.*]

20, Paternoster Row, London,
October 12, 1830.

SIR,—Although I cannot have the satisfaction of furnishing you with any very important evidence on the subject, which the committee of your valuable institution have so laudably undertaken to investigate; yet, with the hope that the addition of my "mite," may tend in some degree, to promote the object you have in view, I venture to give you a brief detail of my limited experience and observation; to which I shall take leave to add a few suggestions for improving the apparatus connected with the generation of steam.

It has never fallen to my lot to be present during the explosion of an *ordinarily constructed* steam-engine boiler, but I have seen the condition of several immediately or soon after that occurrence, and have obtained information upon which I can rely respecting many of the circumstances attending them. I have, however, "stood fire" several times in the experimental disruption of tubular boilers, from a conviction of their innocuous effects, which I shall more particularly notice in the course of this letter.

With respect to the common capacious boilers, the first instance I shall mention was that of a long cylindrical boiler, distinguished in England by the name of Trevithick, as the presumed inventor,* in which three separate burstings took place in precisely the same part of the boiler;—in that part immediately above the strongly ignited fuel of the furnace, and extinguishing the fire each time, but without causing any further material damage: the pressure in each case being upwards of fifty pounds upon the inch. The boiler was made of the best malleable iron. Previous to the disruption there was observed a

* I am inclined to think that your countryman Oliver Evans was the earliest inventor of this long boiler; if so, the merit of our justly celebrated Trevithick will, in *this* instance, be merely that of having spoiled "a good original," by his having increased the diametrical proportions of the cylinder.

bulging, or swelling-out of the metal, which gradually increased till it became nearly of an hemispherical figure, when it burst open and let the water out of the boiler into the fire. The boiler was repaired by putting a thick patch of malleable plate iron over the hole, when after about six weeks wear and exposure to the fire, this metal bulged out again, and burst asunder; a third patch was substituted, and in about a similar period of time, was destroyed in the like manner. As the third disaster might naturally be expected from the results experienced in the first and second, it is proper to notice that the urgent wants of the manufactory were such as to render it expedient to get the engine into working order, notwithstanding that circumstance. The cause of these ruptures appeared upon investigation to be owing to a partial and very intense heat impinging against that particular spot where they took place. A positive proof of this might very likely have been afforded by an alteration in the flue, but the working of the engine was after the last accident discontinued. This boiler was not set with the furnace in its usual situation, but underneath it, at one end; the heated air and flame, consequently, after impinging against the bottom suddenly turned off at right angles to the remotest end of the boiler, where it first entered the internal flue, and the air for combustion was supplied by means of what the masons here call an *air-drain*, consisting of a narrow subterraneous channel leading from the external atmosphere, (that is, outside of the building) into the ash-pit, where it terminated in a small opening near to and directed under the furnace bars;—consequently producing the effect of a continuous blast, upon that part of the boiler where the current of air first impinged.

I am strengthened in this opinion, by the information derived from a friend, that Mr. John Martineau, (a respectable engineer of London) had a boiler which was twice destroyed in the same spot; upon endeavouring to ascertain the cause, Mr. Martineau discovered a fissure in the brick-work, exactly opposite that part of the boiler where the ruptures took place; through this fissure the air rushed with great impetuosity, producing the effect of a blow-pipe upon the metal.

By a reference to the description of the boiler adopted by Messrs. Braithwaite and Ericsson, (inserted in the "Journal of the Franklin Institute,) in the "Novelty" steam-carriage, it will be perceived, that that part of their boiler where the flue first takes a horizontal course, is exceedingly exposed to the destructive influence of the fire, especially when the strong blast they employ is superadded. For having pointed out the imminent risks of explosions incurred by this arrangement of the flue, my motives were impugned and misrepresented; although my intention was chiefly to show the cause of an acknowledged effect, that might have been attended with very serious disaster. My

reason for mentioning this cirumstance here, is, that as Messrs. Braithwaite and Ericsson's boiler has been trumpeted forth by the British press generally as a perfect model for imitation, it may come under the notice of your committee, who will probably decide, whether the arrangement of the parts (however excellent in some respects) is not calculated to cause an early disruption of that part of the boiler, where the flue first takes an horizontal course ? I beg leave also to submit an opinion to your committee, that in forming the flues of steam boilers generally, all sudden bends should be avoided as dangerous, especially such as cause the current of flame and heated gases to strike partially against the boiler ; and if a blowing apparatus be used, that the air should be uniformly distributed over the ash pit, before it reaches the furnace bars ;—and in the case of using an exhausting apparatus in the chimney, the same attention should be paid to a uniform distribution of the air, so as to avoid all partial currents.

Although boilers that are constructed with flues running through them, seem so well contrived for economising heat, (and it is on this account, I conjecture, that they have received so general a preference,) there results from this arrangement a source of danger, from the deposit of soot becoming ignited. I make no doubt, that many boilers have been destroyed owing to this circumstance, and I can instance one case in which this was ascertained to have been the cause :—it was that of a high-pressure boiler at Adams's Forge, Wednesbury, Staffordshire, which exploded a few years ago, killing the proprietor, Mr. Adams, five of his men, besides dreadfully injuring six other persons. The steam in the boiler, was at the usual working pressure of sixty pounds, the safety valve was in good order, and there was plenty of water in the boiler. The flue from the furnace before entering the chimney passed through the steam chamber in the upper part of the boiler, where a quantity of soot was collected, which having been ignited, caused the surrounding metal to become red-hot. In consequence, so sudden and powerful an expansion of the high pressure steam took place, as to render the aperture of the safety valve inadequate to carry off the steam as fast as it was generated, and the catastrophe ensued. The boiler, although formed of the best malleable iron plates, was separated into about fifty parts, which were scattered in all directions, and to great distances. This single fact seems to me to place the *danger* of such an arrangement of parts in a pretty clear point of view, and I think we may therefore safely conclude that the plan is ineligible.

I shall now, Sir, mention a fact that came under my observation, which shews the unfitness of boilers of large capacity or surface being employed for locomotive purposes (wherein the steam is of no practical use, unless of very great elastic force), and likewise the positive necessity of having a *principal* safety valve placed out of the control of the attending engineer, who is natu-

rally very apt (as I have had occasion frequently to notice), to become excited at a moment of difficulty to do very imprudent things.

About three years ago I was invited to attend an excursion of Messrs. Burstall and Hill's locomotive steam coach from Lambeth, near London, but I declined being present, expressing my fears of the safety of the boiler. Several of my acquaintances who did attend, were brought home wounded from the explosion of the boiler, and one of them nearly fatally by a large piece of the boiler striking him, and he was necessarily deposited in the nearest hospital. The wheels of the carriage had got into some loose ground, and the power of the engines appearing inadequate to extricate them, the engineer leaned with his weight upon the safety valve to get an accumulation of power for the purpose. At this time the boiler gave, to the persons surrounding the machine, alarming indications of its weakness, which induced many of them to retire from it; but a friend of mine who was behind it, had the boldness to advance and throw wide open the furnace door; the act was barely completed, when the explosion took place, and he was both lacerated and scalded—none were "killed-off," (to use the *humane* expression of one of our now killed-off ministers of war.) This boiler, like the last mentioned, was made of the best wrought or malleable iron, yet it flew into *pieces*, in spite of those wiseacres who assert that boilers of such iron "only *tear* open." It was of a circular figure, very shallow, with a dome top, the interior being braced together by iron bars, upon the principle of trussing roofs in architecture.

The most frequent cause of disaster, has been, I believe, a deficiency of water in the boiler, owing to the failure or imperfect action of the pumps. Several instances of this have come to my knowledge, but I am not in possession at present with the particular circumstances attending them, and shall therefore only mention one, which was that of a wrought-iron boiler, with a spherical top, of Boulton and Watts's construction, employed at Aston Forge, near Birmingham. In this boiler, it was ascertained, that the explosion was caused by the boiler becoming red-hot, over which the water was subsequently injected by the force pump, producing so instantaneous and powerful a volume of steam, as to overcome the resistance of the vessel.

Your committee is doubtless fully acquainted with all the facts that have appeared in print, respecting the explosion of steam boilers in this country. I allude in particular to the evidence given before committees of the British House of Commons, appointed for that purpose.

Although the fates have never permitted me to be present during the explosion of a *common* boiler, (by which I mean all those having vessels of large capacity) they have allowed me repeatedly to gratify my curiosity by observing the innocuous effects of the bursting of the small distinct chambers of tubular

boilers, produced, by the forcing of water into them, when the metal was at a bright red or approaching to a white heat. The explosion, though alarming to a stranger at first, from the noise and violent ejection of the vapour, is such as to give him confidence to "stand fire" in subsequent experiments. In all those that I witnessed a *rending* of the metal was uniformly produced, of from one to three or four inches in length, and it usually occurred in that part of a tube where the welding had been more or less imperfectly performed, or where from other causes the metal was reduced in thickness. The internal diameter of the tubes in question was barely one inch, the thickness three sixteenths generally, but in the weakest places about an eight of an inch. Although the force of steam to produce such effects might safely be estimated at several hundred pounds upon the inch as a minimum, the maximum cannot be ascertained without knowing how far the tenacity of the metal was impaired by the great heat to which it was subjected. But such results as attended the bursting of those tubes, demonstrated, that under no circumstances of neglect on the part of the engine man (or even of malicious intent, supposing that to be possible), or of accidental derangement in the supply pump, or of the safety valves, &c. no personal danger whatever is incurred by the use of boilers made with them.

In the case of a boiler of the ordinary proportions and capacity becoming red hot by the temporary suspension of the supply of water, which is afterwards renewed, the destructive effect of an explosion as compared with that of the tubular boiler before mentioned, would be in the exact proportion of its increased diameter;—hence, the consequences as respects the scalding water, would be as the area of their respective sections, the length being presumed to be the same in both cases. If therefore we consider the area of the inch tubes as .785, and estimate the diameter of a common boiler to be 24 inches only, this gives an area of 452.39 inches; consequently (as will be found upon calculation) there would be ejected by an explosion of the latter 576 times the quantity of water of the tubular boiler, and with a greatly increased momentum. In reply to this it might be stated that the whole contents of the tubular boiler would be discharged through the fissure opened; but supposing that no provision were made to prevent such a consequence, the jet of water would be merely like that of a small fountain; whereas, in the large vessel of the common boiler, the accumulated force would produce a sudden and instantateous irruption of the whole contents, almost in a body, besides projecting great pieces of metal about. It is worthy also of particular notice, that as the comparative safety of boilers is in the inverse ratio of their diameter, the 24 inch boiler must be 24 times as thick as the inch tubular boiler, to sustain the same pressure; that is, $4\frac{1}{2}$ *inches thick!* It is need-

less to remark, that a boiler of such a thickness would be worse than useless, supposing it practicable to make it.

As the heating of boilers *uniformly* over their surfaces is an object of the utmost importance, your committee will probably think, that the plan of heating, patented and adopted by Messrs. Beale and Porter, of London, worthy of their attentive consideration. It consists, in communicating the heat from the furnace through the medium of a surrounding bath, containing a fluid that requires a higher temperature to vaporize it than water; and by varying the composition of the fluid medium, according to the temperature required in the steam, no excess of heat in the engine boiler can take place; nor can any surplus caloric be retained in the bath, as an open pipe proceeds from it to the atmosphere, to carry off whatever vapour may be there produced. The engine boiler is thus protected from any heat that can injure the tenacity of the metal, which need not be of much more substance than is necessary to sustain the working pressure in the boiler. These are the leading advantages set forth by the patentees; but the real merits of the plan, whatever they may be, will, I make no doubt, be duly examined and estimated by your intelligent committee. (An account of Messrs. Beale and Porter's plan for heating high pressure boilers, will be found at page 39, vol. v. N. S. of the "Register of Arts and Journal of Patent Inventions.")

One of the fruitful causes of explosions in high-pressure steam boilers has been the imperfect action of the force pumps, owing to some derangement of the valves, which they are extremely liable to; on account of the strains to which they are subjected. For this reason the utmost possible simplicity of parts; and the most solid and accurate workmanship, are indispensable. Fine particles of sand insinuating themselves between the surfaces that move in contact very soon render the pumps unserviceable; to prevent which it is highly desirable to use *filtered* water; and the cistern into which the filtered water is delivered, should, I think, have at least two pipes of communication with the "service pipe," and each of the two pipes should contain a moveable box, in which are properly packed the filtering substances, so that either of them may be renewed at pleasure, without impeding the operation of the other. The cocks and union joints required to render this process convenient are too obvious to need mentioning. Whilst I am writing, a thought occurs to me, of which possibly something may be made by the ingenious members of your committee, but as I am somewhat dubious of its practicability myself, I put the idea down in the form of a question.—Could not the filtering boxes just mentioned, be so arranged as to be rendered *chemically* as well as mechanically subservient to the purification of the water,—supposing the filtration to be performed by ascension and the first or lowest stratum of mater, whether solid or fluid

passed through, to be composed of one or more chemical agents, adapted to precipitate the principal matters held in solution by the water? Would not the water thus purified prevent deposits in the boiler, from whence it is so difficult and troublesome to dislodge it by the ordinary practice? It would surely be much easier to abstract the foreign matter obtained by the first process in the boxes, than by the last, of evaporation, in the boiler; and I submit that it had better be only partially done, then not at all. The stratum of earthy matter that usually forms and adheres to the bottoms and sides of boilers, not only causes a great loss of heat, or *waste of fuel*, but by interposing a non-conducting substance between the metal and the water, the fire acts very *destructively upon the metal.* Every member of your committee, is I am persuaded, fully aware of these circumstances, and I only introduce a notice of them here, that they may not escape their attention during their important investigation.

In the application of revolving cocks for feeding high-pressure boilers, I consider it is absolutely necessary that the water should be filtered, provided it contain siliceous or other hard sandy particles, which are particularly destructive to apparatus of this kind. Revolving cocks were applied by your ingenious countrymen, Mr. Jacob Perkins, and Mr. Joseph Eve; but how far they have succeeded in rendering their action preferable to force pumps, I have not had the opportunity of learning.

On the same page of the Register wherein I suggested the last mentioned plan, I proposed as an *additional* security to boilers, that when the mercury should be forced out of the gauge by the undue pressure of the steam, it should be received into a vessel suspended to the power end of a long lever of the first class, whose other end (near to the fulcrum) should be made to lift a safety valve from its seat, loaded with a weight greater than that which ejected the mercury from the tube. By this arrangement the valve would be kept open until matters were arranged, and security to persons and machinery be instantly afforded. If the principle of this proposition be approved of by your committee, I need not point out to them the means of carrying it into execution.

As the various suggestions published in the scientific journals of Europe and America will of course undergo the investigation of your committee, it would be superrogatory in me to notice them particularly; but I will just mention that the fusible plug, Sockl's valve, seem to me to deserve their consideration; and were I not fearful of rendering my letter too tedious to be read, I could mention various other plans to effect the same object that have occurred to my mind; I will therefore here conclude my already too long letter, with expressing the hope, that *something, however little*, may be gleaned from it, and my anxious desire that the committee may rather be induced to inquire whether effective boilers cannot be made, which would injure no person or

thing if an explosion should take place, than that of preventing the bursting of boilers that scatter death and destruction around them when an explosion occurs.

I am, Sir,
With great respect,
Your obedient Servant,

To William Hamilton, Esq. L. HEBERT.

OBSERVATIONS ON THE ATTACK UPON MESSRS. BOOTH AND STEPHENSON, MADE BY THE EDITORS OF THE "MECHANICS' MAGAZINE."

TO THE EDITOR.

SIR,—Were the readers of the "Mechanics' Magazine" *mechanics*, it would be quite unnecessary to correct the extraordinary errors it is continually propagating, relative to the locomotive engines on the Manchester and Liverpool Railway, with the view of bringing into disrepute those very persons, who, by the energetic exercise of their talents, have crowned with unprecedented success, the greatest and most useful public work ever constructed. From the baptismal cognomen of the aforesaid magazine, a very extensive error prevails that it emanates from that pure and cheap fountain of knowledge the "London Mechanics' Institution," where it serves truly a useful purpose, that of enlivening the members after their severer studies, believing with Peter Pindar, that

"Care to our coffin, adds a nail no doubt,
"While every grin so merry draws one out."

It is told of a king of Spain, that when he once saw a man in a retired place with a book in his hand, who was almost splitting his sides with laughter, he observed to his attendants, "that man is either mad, or he is reading Don Quixote." Now were the ghost of his Spanish Majesty to visit the reading room of the Mechanics' Institution, and observe the calm studies of its members, occasionally disturbed by the merriment of one of them, another test of the said members' sanity would be requisite. The greater part of the readers of the work in question being however anything but mechanics, *they* do not laugh at it, but receive as grave truths the absurdities with which it always abounds, in the supposition that they are derived from the source before mentioned. For the information of such persons, and for the protection of the Institution against such injurious misconceptions, I trust you will permit me to notice occasionally some of the grossest of those errors:—In doing which I propose to place the original text, and my comments in opposite columns, to make the comparison more clear.

Text.	*Comment.*
In the last number (Oct. 16) of the "Mechanics' Magazine,"	It is well known to every body acquainted with the progress

Mr. Stephenson's engine, the "Northumbrian," is thus described :—

"It is distinguished from Mr. Stephenson's other engines, by having its boiler and chimney of copper instead of iron; but the chief peculiarity in its construction, is the addition of a branch-tube from the waste steam pipe to the bottom of the furnace, by opening a cock at the end of which the superfluous steam is occasionally drawn through the fire in aid of the combustion, (a contrivance somewhat analogous to the exhausting *principle* of Messrs. Braithwaite and Ericsson's.)

The writer continues :—" The boilers of Mr. Stephenson's engines are all on the *tubular plan*—consisting of a series of straight tubes, of equal diameters, enclosed in one general casing, and *immersed in water*. It appears from Mr. Booth's account of the railway, that this mode of construction, which he calls " new," was " suggested" by him, and that he shared with the Messrs. Stephensons the premium of 500*l* which was awarded to the Rocket of mechanical inventions, that Messrs. Braithwaite and Ericsson have never proposed any thing new in exhausting apparatus, and that they never attempted to apply an exhausting apparatus until nearly half a century after other people had both used and published them—so much for the " exhausting *principle*" of the editors, (I speak in the plural number, as there is no telling, as you have observed, whether Mr. Braithwaite, Mr. Robertson, or Mr. Ericsson is the writer.) As to the " analogy," a moment's consideration will show that no two processes can be more different than *supplying* and *exhausting*.* Had they said, that Mr. Stephenson's contrivance was " somewhat analogous" to the plan of the ingenious Mr. R. Evans, described in your 3d vol. p. 1, they would have been *somewhat contiguous* to the truth.

This is truly a funny passage throughout. The writer first states, that Mr. Stephenson's engines " are all on the tubular plan"—then, he shows that they are not, by saying they are " *immersed* in water"—next, he finds fault with the boiler for *being*, what he has shown *they are not*—again, they " differ in no respect from many others" although it would puzzle his brains to find a " somewhat analogous" arrangement. Not content with all this

* *This* error has been corrected by the Editor himself, in the last number of the " Mechanic's Magazine," by the following notice :—

For " The peculiarity in its construction," and ending " Mess. Braithwaite and Ericsson," read—' the chief peculiarity in its construction is a continu-'ation of the waste steam pipe which discharges at some distance from ' the top of the chimney, thereby creating a draught by the expulsion of ' the heated air (somewhat analogous to the exhausting principle of Messrs. ' Braithwaite & Ericsson), there is also an addition of a branch tube from ' the waste steam pipe to the bottom of the furnace, by opening a cock at ' the end of which the superfluous steam is occasionally suffered to escape ' through the fire in aid of the combustion.'

in October last. Neither Mr. Booth nor the Messrs. Stephensons, however, can fairly lay claim to any novelty of invention on this account. The use of tubes has been long a favourite project with steam engine improvers; and the boilers of Mr. Booth and the Messrs. Stephensons differ in no respect from many others that might be mentioned, except in the extraordinary number of tubes they employ. The tubes in the Northumbrian amount to no less than 150. Neither does it appear that these gentlemen have fallen upon any contrivance to obviate the objection, which it has been generally allowed exists, to the use of small tubes; namely, their great liability to incrustation. The tubes of their boilers require to be cleaned out (by a long iron scraper) after every journey that is performed; and we should suppose that, ere long, this circumstance will be found to effect, in no slight degree, their durability."

"The quantity of fuel consumed by these engines, is a point on which Mr. Booth and the Messrs. Stephensons have still some information to give the public. They have been hitherto remarkably silent on the subject. —*Judging* from our own observation, we should say that it is something enormous."

"The work performed by the

sublime inconsistency, he goes on to say, "neither does it appear that these gentlemen have fallen upon any contrivance to obviate the objection" to that which they do not use, and then he shows that they *have obviated* the pretended objection, by being able to clean out the tubes after every journey. The plain fact is, that Messrs. Stephenson and Booth's boiler, consists of one capacious cylinder containing the water, and that the tubes are a series of small *flues* distributed throughout the water, leading from the furnace in front of the machine, to the chimney at the back.

The public have no more right to this information, than they have to a knowledge of the cost of printing the "Mechanics' Magazine." "Judging" from the manner in which the heat is diffused throughout the whole body of the water, I am inclined to think the economy of fuel "somewhat contiguous" to the smallest possible quantity to produce a given quantity of steam. My sincere belief is, and *I challenge a proof to the contrary*, that neither the William the Fourth nor the Adelaide (let Messrs. B. and E. blow them up as much as they like) can produce an equal effect to the Northumbrian, with a given quantity of fuel.

This attempt to depreciate

engines—though decisive of the practicability of travelling at a rate of speed hitherto unequalled —*falls considerably short of what machines of their estimated capabilities should be able to perform*. Mr. Booth has shown, that "an engine on the Rocket principle, with the latest improvements, and weighing 4 tons 10 cwt." should be exactly able to draw after it "thirty tons weight, *on a level*, at fifteen miles an hour," and "seven tons *at the same speed* up an inclined plane, rising one yard in a hundred." Now, let us compare with this standard the performances of the Northumbrian; an engine which, being one of the latest made, must of course include "the latest improvements." Its weight is 6 tons 3 cwt.; and it should by proportion (*allowing the force of gravity to be equal to the friction of double the weight*) be able to draw 33 tons 6 cwt. on a level, and 7 on an inclined plane. But the weight which the Northumbrian is in the daily practice of drawing does not exceed 14¼ tons.

At the *same rate of speed* with which the Northumbrian now draws 14¼ tons, it should not be able to draw 33 tons 6 cwt. at a greater velocity than about 6 miles an hour; but how trifling in that case would be the advantage achieved over canals?

You may gain speed by reducing the weight; but in proportion as you do so, you must increase the expense.

"Messrs. Braithwaite and Ericsson, the patentees of the Novelty, have *contracted* with the Company to furnish an engine not exceeding 5 tons weight, which shall draw 40 tons gross from Liverpool to Manchester in

Mr. Stephenson's successful labours comes with a very bad grace, from the party whose "crack" engines have never yet been able to show themselves in competition. The William the Fourth," "*estimated*" by the Mechanics' Magazine as a twenty horse engine, has hitherto shown itself to be able to draw nothing but itself, and even then to *get off the rails*. On this latter point, Mr. Stephenson's improvements upon the axles of carriages, (described in the 3rd vol. first series, of the Register, page 309) may afford Messrs. Braithwaite & Co. a usefel hint or two.

The calculation made, or attempted to be made, is perfectly inexplicable; the basis of it, (if it is not as "baseless as the fabric of a vision") is some new rule, perhaps, discovered by the editors.—"*Allowing the force of gravity*" (they say) "*to be equal to the friction of double the weight;*".. let us see if we can make out what is meant by this. Now "the force of gravity" being the weight, which is said to be 6 tons 3 cwt.; and double the weight is 12 tons 6 cwt. therefore the friction is 6 tons 3 cwt. or half the weight. Thus the editors make the friction on the railway five times that of the common gravelled road! Need I now notice the results of calculations made upon such data?

The terms of this contract have been repeated in the Mechanics' Magazine so many times, that it would appear they considered *contracting* to be more meritorious than *performing*; they tell us over and over again that

two hours (being assisted up the inclined plane.) The consumption of coke not to exceed half a pound weight per ton drawn per mile." The Company have shown by entering into this contract what they consider to be the *desideratum* in the case; but which of all Messrs. Stephenson and Co's engines could come within *fifty degrees* of that desideratum? Messrs. Braithwaite and Ericsson *profess to entertain as confident an expectation as ever of their being able to fulfil their contract*; and from what we have ourselves seen of the engines, we have no hesitation in saying, that it appears to us to be an expectation perfectly well founded." they *have positively contracted*, and they conclude by saying, that they "PROFESS *to entertain*" an expectation of being able to *perform* it. I shall be right glad if they do: but until they do, it would be as well to abstain from crowing so loud about the "*desideratum*," and the "fifty degrees" which is not applied as any measure of quantity, though by it the consistent writer professes to determine the demerits of Mr. Stephenson for *doing* that which Messrs. Braithwaite and Ericsson "*profess* to entertain an expection" *of being able to do*.

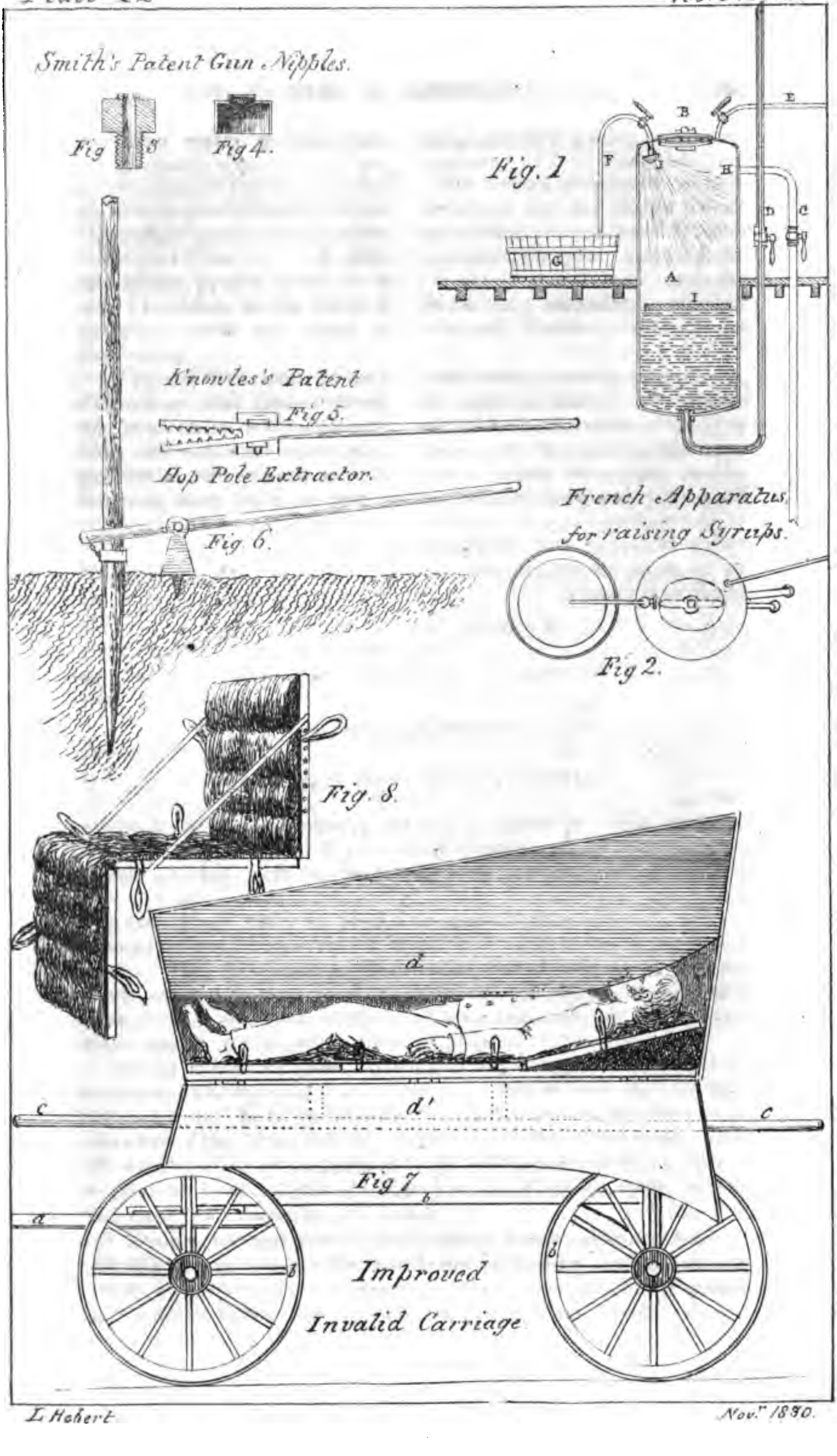
I remain, Sir,
Your constant reader,
A MEMBER OF THE LONDON MECHANICS' INSTITUTION.

IMPROVED INVALID CARRIAGE.

THIS machine, which is for the express purpose of conveying patients to and from hospitals, with as little pain, inconvenience, and delay, as possible, as represented at Plate XII, by figures 7 and 8.

Fig. 7 exhibits the carriage and body together, to be drawn by one horse, attached to the shafts *a* of the carriage *b b*, or by two men applying themselves to the poles *c c* of the litter *d d'*. Or the litter alone may be carried by two men, in the manner of a sedan chair; and in order that this may be done instantly the litter is made so as to be detached from the wheeled carriage by merely *lifting* it off. The latter rests upon light lance-wood bearings, which operate as easy springs. In this drawing a patient is represented as lying down upon a folding mattress, which is contrived so as to form the seat or chair, exhibited by fig. 8, to carry the patient up or down stairs, &c. For the convenience of removing the patient out of the litter, the case *d* opens sideways by folding flaps, one of which is seen, as down at *d'*.

The machine itself, complete in every respect, may be inspected in the gallery of the National Repository, at Charing Cross.



L. Hebert
Nov.r 1830.

ON THE VARIOUS KINDS OF RAIL ROADS.

IN the preceding parts of this work numerous detached notices of particular railways have been inserted, but a connected view (*coup d'œil*, as it were) of the *several distinctive kinds* has been hitherto omitted. To supply such a deficiency in this metallic age, when people think of little else but iron, steam, and the vote by ballot, is the object of the annexed summary; which is compiled from the works of Tredgold, Palmer, Wood, and Brewster.

The are three distinct kind of rail-roads, namely, *edge*, *tram*, *suspension*, and each of these have some varieties. The oldest and most extensively adopted consisted in laying rails of wood or iron, the carriages being guided therein by flanges on the peripheries of the wheels, and these were called *edge-rails*, to distinguish them from the tram-plates. which came into use afterwards.

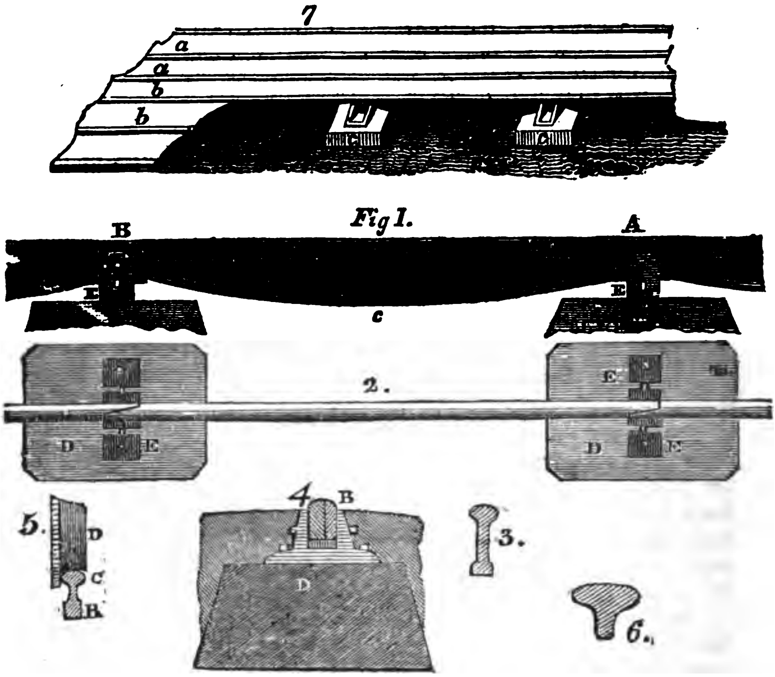
EDGE RAIL-WAYS

Were first made of wood in the neighbourhood of Newcastle, for the purpose of conveying coals to the side of the river Tyne; these were next covered with plates of wrought iron in the parts most liable to wear. Cast iron was subsequently introduced there, as well as in many other parts of the country, and now wrought iron is being very generally substituted for the cast.

In the annexed cuts, figs. 1, 2, and 3, are a side view, plan, and transverse section of a cast iron edge-rail, of the form which has been adopted in the best railways on the banks of the Tyne and the Wear. The waggons run upon the rounded edge of the rail, which is smooth, and laid as evenly as possible. The length of these rails is usually 3 feet, with a depth of 4½ inches in the middle, and breadth of the top 2 inches. The ends of the rails rest on a piece of cast iron called a *chair* (as shewn at fig. 4) and the chairs are fixed to blocks of stone called *sleepers*, (being a'ways in bed), these have a broad base, and weigh about 2 cwt. each. They are firmly bedded in the ground, and are adjusted to the plane required for the road, before the chairs are connected to them. The goodness of the road depends much on the fixing of the sleepers in a sound and firm manner.

In fig. 1 the side view of the rail C is shown supported at the extremities A B, by cast iron chairs E E, which rest on the stone sleepers D D. In fig. 2, the plan, is shown the scarf joints where the ends of the rails meet in the iron chairs E E. Fig. 3 represents the cross section of the middle of the rail as at C in fig. 1, which is the middle of its length. Fig. 4 is a cross section at B, through the joint chair and supporting block.

Rails made entirely of malleable iron were first employed by Mr. George Grieve, at Sir John Hope's collieries near Edinburgh; these were formed of rectangular bars, which obviously present too small a surface for the wheels to run upon, or otherwise re-



quire more materials than it would be consistent with economy to employ; and to obviate this difficulty, a patent was obtained by Mr. John Birkinshaw, of Bedlington Iron Works, Durham, for an improved form for the bars to be used as rails. It consists in giving the bar the form of a triangular prism, or such variation of that form as is best adapted for that purpose. Fig. 5, (in the preceding engraving) represents this section recommended by Mr. Birkinshaw, and he proposes that the rails should be eighteen feet in length. Fig. 6 represents another form, which is evidently better. His suggestion, respecting welding the joinings, would rather be injurious than useful, owing to the expansion in length by increase of temperature.

The chief advantage of wrought iron rails is that of reducing the number of joints; and the difficulty of making the rails perfectly even at the joints has contributed much towards their introduction.

Edge rails are most adapted for permanent works. They are of such a nature, that ordinary carriages cannot be employed upon them; but on any railway where such carriages can be used, they must do more injury to the surfaces of the rails, than will be equivalent to the advantage of suffering them to go there.

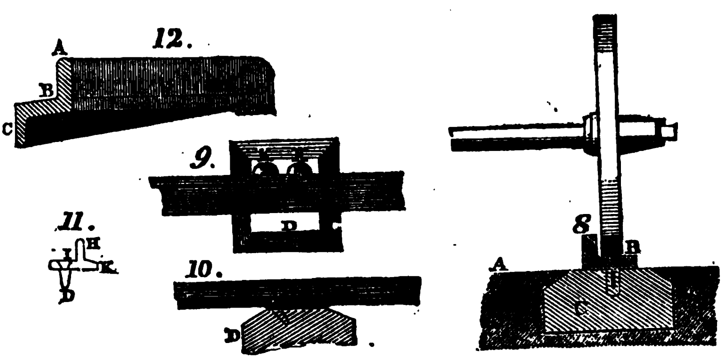
Tram-ways, or Tram-roads,

Differ from the preceding kind, in having the guiding flanges upon the rails, instead upon the wheels of tbe carriages; it gives the advantage of employing carriages that can be used where there are not rails laid down. They are called *tram*-roads, from their being first used for drawing trams upon. The tram-rail is exceedingly convenient for temporary uses, and in its ordinary form (as represented at fig. 8, in the subjoined engraving), it is much used in quarries, in mines, in forming new roads, and in digging canals, in conveying large stones for buildings, and other purposes. Tram-rails are of a very weak form, considering the quantity of iron in them, and in some works it had been found necessary to strengthen them, by adding a rib on the under side. Fig. 12, shows half a tram-rail of this kind in perspective, A being the guide; B the bed of the rail, in which the wheels run; C the rib on the underside to strengthen it. The rails used for repairing the Surrey tram-roads were of this form, and it certainly renders them very strong.

The third kind of railways mentioned are those on the principle of suspension, of which that invented by Mr. H. R. Palmer, is we believe, the earliest and the best. (See *Register of Arts* vol. 1, page 96 and 113—vol 2, page 72, 150—vol. 3, page 140;—also Fisher's railway, vol. 3, page 268.—James's, vol. 4, page 6, &c.

As tram-rails are applied with so much benefit in forming temporary ways, the most convenient and ready mode of putting them down is an object of some importance. The common method is to fix them with large nails or spikes upon cross sleepers of wood. The chief inconvenience of this plan is the difficulty of driving and drawing the nails when they have to be changed.

For permanent roads, the rails are usually fixed by spikes driven into wooden plugs, previously inserted in the blocks of stone for supporting the rails, as shown in fig. 8; where B shows the tram-plate (in section), with one of the running wheels of the carriage thereon; C the stone sleeper, in which is inserted the wooden plug to receive the nail: A is part of the gravelled horse-path or road.



An attempt to improve the method of putting down tram-plates, by Mr. Le Caan, affords great facility in taking up or putting down the rails; they are contrived so as to fix one another, without the aid of nailing. Fig. 10, represents a longitudinal section of two of these plates, placed on a stone sleeper *d*, and fig. 9 is a plan of the two plates. The plates are joined by a dove-tailed notch and tenon, and an oblique plug is cast on each plate, which is let into the stone sleeper. But, for the advantage of taking up the plates, to repair any defect, there are plates at every thirty yards, with perpendicular plugs; such plates are called stop plates. The diameter of the plug near the shoulder is one inch and three quarters, at the point one inch, its length is two inches and a half, and its obliquity, shewn in fig. 10, about eight degrees. A small groove in the whole length of the exterior of such plug, is made to allow the water in the hole to expand in freezing, and it also serves to admit a wire to draw a plug out by. The holes for the plugs should be cut to the depth of three inches, by a standard gauge of cast iron, and counter-sunk, so as to allow the end of the plate to bed firmly on the block which supports it.

Fig. 11, is one of the ends of a tram plate, in which H shews the flange or upright edge; *i* the flat part or sole, in which the wheels of the waggon run; D one of the plugs, and K a projection behind, to render the plates firmer upon the blocks. The usual length of one plate is three feet; the flanch H is one and a half inch high; the sole or bed, three and a half or four inches broad, and three fourths of an inch thick; but these dimensions are varied according to circumstances: the most approved weight has been forty-two pounds for each plate. The ends from which the plugs project, under which the tenons and notches are made, should be a quarter of an inch thicker than the other parts of the plate.

In this method the wheels of the waggons cannot be obstructed by the heads of the nails rising above the surface, and the blocks are not disturbed by fixing the plates; and when repairs are necessary, the plates must be formed for the purpose.

When tram-plates are fixed by spikes to stone sleepers, there is some difficulty in keeping the joint even and in its place, but it seems to be successfully obviated by using a saddle piece to receive the ends of the nails at the joints, an improvement which was introduced by Mr. Wilson on the Troon tram-road.

AN ACCOUNT OF AN EXTRAORDINARY ADHESION OF THE SAFETY VALVE OF THE BOILER ON BOARD THE STEAM BOAT, LEGISLATOR, ON THE HUDSON.

By the ENGINEER.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

SIR,—The late awful explosion of the steam boat, Helen M'Gregor, has brought to my recollection an accident that occurred last summer under my own eye. Believing it may serve the cause of humanity, I think it my duty to make public the fact; it is this:

Last summer I was engineer on board the steam boat, Legislator, belonging to Hudson: standing on the forward deck, I noticed that the engine was working faster than common, and not seeing any steam flow as usual from the safety valve, I started for the fire-room, where I met the fireman then on duty; he told me that he had on twenty-one inches of steam, and that the rod in the steam gauge was up against the boiler deck. As the safety valve was loaded to carry only sixteen inches, I became alarmed, and went to the fire-room and took hold of a cord that ran over a pulley, and was attached to the lever of the safety valve, and attempted to raise the valve but could not; I was still more alarmed, and went on the top of the boiler, where the safety valve was, and found all right there, that is, there was no extra weight on the valve; I then slided the weight in to the length of the lever up to the fulcrum, where the weight was merely nominal, still the valve did not rise; I became confounded; I took hold of the lever and lifted on it pretty stoutly, and continued lifting for some seconds, when all of a sudden, with an explosion like that of the report of a small field-piece, the valve opened, and the steam rushed out violently; it continued to do for some length of time before the steam got down to the usual pressure, the engine being at work all the time. There was no water on the valve, nor any visible obstruction to its rising of its own accord after the steam got beyond the pressure of sixteen inches, which it had invariably done before. Now, Sir, must not this obstruction to the valve rising have been caused by an adhesion that took place between the valve and the valve seat, both of the same metal? I think it certainly must have been caused by this adhesion of the metal only. I have had an experience of twelve years as an engineer, and never knew the like occurrence before. For many reasons I have not placed full reliance in the mercurial steam gauge, but have always had entire confidence in the correctness and safety of the safety valve; but in this case I was deceived, and perhaps in a few moments more an explosion might have taken place, for I have no doubt that if the small rod in the steam gauge had had a free passage through the boiler deck, it would have denoted thirty instead of sixteen inches.

It is usual on board steam boats to have the steam gauge so graduated as to show as many inches of steam as the engine will take, and to have the safety valve loaded so as to agree with the steam gauge, believing that when the steam gauge indicated sixteen inches

of steam, all the surplus steam would escape through the safety valve. Engineers, or many of them, are in the habit of not blowing off any steam when the boat stops to make a landing, but depend wholly on the safety valve rising of itself after the steam has risen a little above its required height. This has been considered a safe way of proceeding, but the case stated above shows, most conclusively, that it is wrong to depend too much on the safety valve. I would recommend, by all means, that when a boat stops to land passengers, that the safety valve be raised, let the gauge indicate what pressure it may, this, Sir, is the only safe way. Might not the engineer of the Helen M'Gregor have placed an implicit confidence in his safety valve rising when the steam had got to its required height, and is it not possible that an adhesion had taken place between the valve and the seat? And perhaps at the same time he was waiting for the valve to rise, he had double the required quantity of steam, which caused the awful explosion—such may have been the fact. Before the occurrence of my safety valve not rising when it ought, I had believed the cause of boilers exploding was almost invariably the want of a sufficient quantity of water. I now think some explosions may be attributed to the being deceived by the safety valve not rising as was expected by the engineer. If you think the above stated facts are worth a place in your valuable Journal, you are at liberty to insert them. You will please to word and arrange this account to suit yourself. I know nothing about making out a statement for a public print, but you may rely on the correctness of the fact above narrated; it can be testified to by the pilot, the clerk, and the fireman of the boat.

Your obedient servant,

New York, JOHN B. CALHOUN, Engineer.
April 12, 1830.

Remarks by the Editor.—We insert the preceding communication in the form in which it was received, and shall always be much gratified by the correspondence of observing practical men upon subjects with which they are conversant. The simple, unpretending style in which the foregoing facts are narrated, could not be improved by any effort of our's.

We differ from Mr. Calhoun in his estimate of the value of the mercurial steam gauge, and think that the case stated must convince him of its utility. In order to judge of the cause of the adhesion, the exact form of the valve, and other circumstances relating to it, ought to be known. So far as the account goes, it appears that there was, in the present case, an actual adhesion of the valve to its seat, which, although not unfrequent to a certain extent, existed with a degree of force which was extraordinary. Our scientific readers are acquainted with that kind of adhesion which was first brought into general notice by M. Clement, of France, and which has since given rise to much discussion: there is nothing, however, to lead to the conclusion that the present case was in any way related to it, as an emission of steam would then have accompanied the adhesion. Our wish is to excite discussion rather than to offer opinions; we shall, therefore, leave the question at present to our correspondents.

List of New Patents Sealed, continued from p. 160.

LOCOMOTION.—To J. Hanson, of Huddersfield, Yorkshire, for improvements on locomotive carriages.—Dated 31st August, 1830.—Specification to be enrolled in six months.

CARRIAGES.—To P. Williams, of Holywell, Flintshire, for an apparatus for preventing accidents in carriages, instantly liberating horses from the same, and locking the wheels, &c.—7th September, 1830.—Six months.

LOCOMOTION.—To C. B. Vignoles, of Furnival's Inn, London, and J. Ericsson, of Brook Street, Fitzroy Square, Middlesex, for certain additions to the engines commonly called locomotive engines.—7th September, 1830.—Six months.

COCKS.—To W. Cook, of Redcross Square, Cripplegate, in the City of London, for improvements on cocks for supplying kitchen ranges and cooking apparatus with water, &c., to be called "fountain cocks."—7th September, 1830.—Six months.

FIDS.—To H. G. Pearce, of Liverpool, R. Gardner and J. Gardner, of the same place, for an improved fid.—7th September, 1830.—Six months.

BUILDING.—To J. Chadley, of Gloucester Street, Queen Square, for improvements in making bricks, tiles, and chimney bars, applicable to the building or erecting the flues of chimneys.—13th September, 1830.—Six months.

CHIMNEYS.—To S. Smith, of Wilton Crescent, Hanover Square, for improvements in Chimneys.—14th September, 1830.—Two months.

LIST OF NEW PATENTS SEALED.

BOATS.—To W. Church, of Haywood House, Birdsly Green, near Birmingham, for certain improvements in the construction of boats and other vessels, a part of which improvements are applicable to the construction of crriages.—Dated 21st Sept. 1830.—Specification to be enrolled in six months.

SILK.—To F. Molyneux, of Hampstead, and W. Bundy, of Kentish Town, for certain improvements in machinery for spinning and twisting silk and wool, and for roving, spinning, and twisting cotton, flax, hemp, and other fibrous snbtances.—Dated 21st September, 1830. Six months.

GLAZING.—To J. Harrison, of Wortley Hall, York, and R. G. Curtis, of the same place, for certain improvements in glazing horticultural and other buildings, and in sash-bars and rafters.—6th October, 1830. Six months.

SUGAR.—To C. Derosne, of Leicester Square, for certain improvements in extracting sugar or syrups from cane-juice and other substances containing sugar; and in refining sugar and syrups. Partly communicated by a foreigner —29th September, 1830. Two months.

GAS.—To M. Donovan, of Dublin, for an improved method of lighting places with gas.—6th October, 1830. Six months.

FIRE ESCAPE.—To Lieut. Col. L. Walker, C. B. of Cumming Street, Pentonville, for a machine or apparatus to effect the escape and preservation of persons and property in case of fire or other circumstances.—6th October, 1830. Six months.

ANCHORS.—To R. Perring, of Exmouth, Esq. for an improvement or improvements on anchors.—6th October, 1830. Six months.

PROPELLING MACHINERY.—To J. Heaton, W. Heaton, G. Heaton, and R. Heaton, of Birmingham, for certain machinery, and the application thereof, to steam engines, for the purpose of propelling and drawing carriages on turnpike roads, and other roads and railways.—6th October, 1830. Four months.

PAPER.—To J. Dickenson, of Nash Mill, in the county of Hertford, Esq. for an improved method of manufacturing paper by means of machinery. —6th October, 1830. Six months.

SUGARS.—To W. A, Archbald, of Vere Street, Cavendish Square, for an improvement in the preparing or making of certain sugars.—13th October, 1830. Six months.

PRINTING.—To D. Napier, of Warren Street, Fitzroy Square, for certain improvements in printing and in pressing machinery, with a method of economising the power applicable to the same, which method of economising power is also applicable to other purposes.—13th October, 1830. Six months.

TANNING.—To F. C. Jacquemart, of Leicester Square, Esq. for improvements in tanning certain descriptions of skins. Communicated by a foreigner.—20th October, 1830. Six months.

EVAPORATION.—To To J. B. Sharp, of Hampstead, Esq. and W. Fawcett, of Liverpool, for an improved mode of introducing air into fluids for the purpose of evaporation.—20th October, 1830. Six months.

VENEERS.—To A. Craig, of Ann Street, Saint Bernard's, in the county of Mid Lothian, for certain improvements in machines or machinery for cutting timber into veneers or other useful forms. Communicated by a foreigner —20th October, 1830. Six months.

DISTILLATION.—To A. Ure, of Burton Cresent, Middlesex, for an apparatus for regulating temperature in evaporization, distillation, and other processes.—20th October, 1830. Six months.

SUGAR.—To A. Ure, of Burton Crescent, Middlesex, for an improvement or improvements in curing or cleansing raw or coarse sugar.—20th Oct. 1830. Six months.

AIR-STOVES.—To A. Ure, of Southampton Row, Middlesex, for an air-stove apparatus for the exhalation and condensation of vapours.—20th Oct. 1830. Six mouths.

SADDLE CLOTH AND GIRTHS.—To S. Clerk, of South Down, Brixham, Devon, for certain improvements in making or preparing saddle-cloth and girths, for keeping saddles in place on horses and other animals of burthen.—20th October, 1830. Six months.

EXCAVATIONS.—To Sir T. Cochrane, Knight, (commonly called Lord Cochrane,) of Regent Street, for his invented apparatus to facilitate excavating, sinking, and mining.—20th October, 1830. Six months.

BRUSHES.—To T. Mason, of Great Portland Street, Middlesex, for an improvement in the manufacture of painting brushes, and other brushes applicable to various purposes.—20th October, 1830. Six months.

GAS METERS.—To S. Clegg, of Sidmouth Street, Gray's Inn Lane, for an improved gas-meter.—20th October, 1830. Six months.

TO OUR READERS AND CORRESPONDENTS.

Hilton's Boring Instruments.—We have received a letter from *Mr. Hilton*, of Regent Street, stating that the boring tool described in our July number as Mr. Russell's invention was the invention of the writer (Mr. Hilton), for which he received a medal of the Society of Arts in their last session. Mr. Russell was only the manufacturer.

Invalid Carriage.—We have inserted the drawing and description of this carriage, notwithstanding the inexplicable "*rudeness*" of the person who sent it.

Erratum.—After the words "last-mentioned plan," page 179, line 26, there should have been inserted a parenthesis, referring to the preceding number of the work, wherein the *plan* in question was given.

PATENTS ENROLLED BETWEEN 10TH OCTOBER, AND 10TH NOVEMBER, 1830.

Particularizing the Offices in which the Specifications may be inspected, with the Dates of Enrolment.

STEAM BOILER.—To William Altoft Summers, of St. George's Place, St. George's in the East, Middlesex, Engineer, and Nathaniel Ogle, of Millbrook, Hampshire, Esq. for "certain improvements in the construction of steam engine and other boilers, or generators, applicable to propelling vessels, locomotive carriages, and other purposes," was granted on the 14th of April, and the specification was deposited in the Enrolment Office on the 14th of October, 1830.

The steam boiler of Messrs. Summers and Ogle, consists of a series of tubes, twenty-five in number, as represented by the drawing attached to their specification, placed vertically, with a fluid passing up the centre of each; as represented by the drawing fig. 3, Pl. XIV., where *a a a* represent the exterior tube containing the water and steam; *b b b* the interior tube or flue for the passage of a portion of the smoke, the rest passing off between the exterior tubes; and thus the water in the boiler is continually exposed to an extensive surface of heated metal. *c c c* are the ends of the internal tubes, passing through the screwed nuts *d d d* at top and *e e e* at bottom, and by which both the exterior and interior tubes are secured in their places. The water is supplied to the boiler through the pipe *f*, by a force pump of the usual construction; and the steam when generated, passes off to the engine by the pipe *i*. A plan of this boiler is represented by fig. 4, where the same letters refer to similar parts.

It will be readily perceived that the different parts of this boiler can be put together with much facility; so that a defective tube can be instantly removed and a sound one substituted, by simply unscrewing the interior tube or flue: but of course, very great care will be necessary in making all the tubes constituting the boiler of precisely the same length, otherwise a source of imperfection would arise, from the larger tubes preventing the shorter ones from being screwed sufficiently close to render them steam-tight.

BRITISH TAPIOCA.—To John M'Innes, of Aucheureoch, and of Woodburn, North Britain, Esq. for "the manufacture or

preparation of certain substances which he denominates the British tapioca, and the cakes and flour to be made from the same," was granted on the 24th of April, and was deposited in the Enrolment Office on the 24th of October, 1830.

Mr. M'Innes proposes to manufacture a substance for food from potatoes, parsnips, beet-roots, and other fibrous roots indigenous to this country, or introduced from other countries, and cultivated here: and this he denominates British tapioca. The roots are first to be washed and well cleaned, and then to be grated down and mixed with water till they become a fine pulp; the fibrous matter is now to be separated by sieves of the usual construction. And lastly, the pulp is to be dried in a cast-iron pan: being subjected to continual stirring during the process of drying, to prevent the farina from sticking to the bottom or sides of the pan and burning. When the farina is sufficiently dry it will assume a granulated form, and should be preserved in a dry state till required for use. When the tapioca is to be made into cakes, wooden moulds of the required size and form are to be employed in drying. To reduce the cakes to powder for use, a flour or other similar mill must be employed.

The patentee mentions that he has observed in the manufacture of tapioca in the West Indies, the application of a process similar to the one described by him; but we do not perceive that it differs in any essential particular from the method well known and usually employed in making tapioca from the starch of potatoes.

METALLIC PENS.—To James Perry, of Red Lion Square, Holborn, Middlesex, Bookseller and Stationer, for "an improvement or improvements in or on pens," was granted on the 24th of April, and the Specification was deposited in the Enrolment Office on the 24th of October, 1830.

The pens invented by this patentee, he denominates the Perrian pens, and they differ from other pens from having the elasticity below instead of above the shoulder, or the place where the tapering of the pivots commences, and from this circumstance they partake more of the character of the goose quill pens than those metallic pens with the long slit and the circular or rectangular aperture above the shoulder. Mr. Perry proposes to increase the elasticity near the point by bringing the aperture, which may be made either elliptical, oval, circular, oblong, square, or rhomboidal, below the shoulder, as represented by figs. 6, 7, 8, 9, 13, in Plate XIV., or by introducing one or more branch

cuts on each side of the slit below the shoulder, as represented by figs. 10, 11, and 12. In all cases the points of the pens are to be rendered as weak and flexible as can be done without rendering them liable to fracture when in use.

The best steel is recommended for the manufacture of these pens, which are to be subjected to to the process of spring tempering, to increase their durability, and to prevent them from taking a set by the pressure necessary to produce a thick line.

BOLTS AND CHAINS.—To Samuel Brown, of Billiter Square, London, Commander in our Royal Navy, for "certain improvements in making or manufacturing bolts and chains," was granted on the 24th of April, and was deposited in the Enrolment Office the 24th of October, 1830.

It has been found, that the links of chains, broken by experiment or by accident, always give way at the scarfing places, where the links are welded; and to remedy this imperfection is the object of Mr. Brown in the invention before us. He proposes to make each link thicker at the welding than it is at any other part, and with this view he manufactures the bolts or rods of which the chains are to be made, with enlargements at distances corresponding with the length required for each link. Fig. 2, Plate XIII, represents part of one of these bolts, which are to be made by passing them first through a series of grooves gradually diminishing between a pair of rollers, such as are generally employed in the manufacture of rod iron. The rods are then, while yet hot, passed through a series of grooves on a pair of conical rollers, as those represented by fig. 3, Plate XIII.

The greatest diameters of these conical rollers mostly correspond with circumferences equal to twice the length of rod required for a link, and on the opposite sides of the roller are enlargements of the grooves for the reception of the thick part of the rod intended for the scarf. As the rod, or rather the space between the projections on the rod, will be somewhat lengthened by each passage through the rollers, the operation must be commenced at the smaller end and finished at the larger, by which means each projection will fit into its corresponding cavity in the grooves. *a a* are the two rollers; *b b b b* the grooves; *c c c c* the cavities in the grooves; there are a pair of bevil wheels, by which they are put in motion, by steam or other power.

The length of the projections must be thrice the diameter of the rod between the projections, and its diameter must be the

eighth of an inch greater than the diameter of the other part. When the rod passes the last time through the rollers, and before it is permitted to cool, it is to be cut in pieces for the links, in a sloping direction, as represented by dots at *d d*, fig. 2, for the scarfs; the length of the cut being two diameters of the bolts.

The importance of this improvement seems somewhat doubtful; but it is effected by a combination of machinery at once ingenious and simple.

HEATING WATER.—To Paul Descroizilles, of Fenchurch Street, London, Chemist, "for certain improvements in apparatus for economising fuel in heating water, and are applicable to various purposes," was granted on the 24th of April, and was deposited in the Enrolment Office on the 23rd of October, 1830.

The intention of this patentee is, to transfer heat from one quantity of water to another, without mixing the quantities, an operation which would be frequently found useful in the establishments of extensive dyers, brewers, &c. where much hot and cold liquids are employed; there are many instances where dirty water is discharged at a high temperature, which might be advantageously transferred to the clean water which is admitted to supply its place. He proposes to employ a wooden trough, with three partitions, one in the middle, reaching from the bottom very nearly to the top, and one on each side of it, reaching from the top to very nearly the bottom.

An internal view or elevation of this apparatus is given by fig. 5, Plate XIV. *a a* is the trough or tub. The hot water enters by the pipe *b*, and passing under the partition, filling the chamber *c*, it runs over the partition *d* into the chamber *e*; then running under the partition *f*, it passes out of the vessel by the pipe *g*, deprived of its heat by the action of the cold liquid passing along the pipes in a contrary direction, in contact with the heated water. The cold water is brought on by a horizontal tube *h*, descends by the pipe *i* into the bottom reservoir of a system of pipes *k*, and rising through them it passes round the bent tube *l*, and descends into another similar system of pipes and vessels *m*, abstracting the heat in its progress from the warm water, which surrounds all the pipes and entirely fills the internal vessel, the clean water originally cold, passes finally out of the apparatus in a heated state, derived from the water originally hot, by the pipes *n o*.

Explosions of Steam Boilers, to prevent.—To Joseph Cochaux, of Fenchurch, Street, London, Merchant, "for an apparatus calculated to prevent or render less frequent the explosion of boilers in generating steam," was granted on the 24th of April, and was deposited in the Enrolment on the 23rd of October, 1830.

To remove the safety valve quite away from its seat, that the steam may freely escape when it reaches a given pressure, seems to be the intention of Mr. Cochaux, who effects by using a mercurial gauge and a float with a counterpoise, when the mercury rises in the gauge to a certain elevation, descends upon the extremity of a long lever, which lifts the safety valve entirely from its seat. The arrangement of this apparatus is represented by fig. 4, Plate XIII, where *a a* shows part of a steam boiler, set in brick-work; *b* the safety valve, with its lever *c d* turning on the fulcrum *e*, and loaded by the weight *f*. The mercurial gauge is represented by *g g g*, with its float on the surface of the mercury at *h*, and the line passing over the pulley *i* and supporting the counterpoise *k*. Immediately under this weight is the extremity *d* of the valve lever, which is provided with a scale pan, to receive the weight when the mercury is forced by the steam high enough to let the weight rest on it, by which the valve will be raised. This arrangement will have the advantage of overcoming any sticking which might take place between the valve and its seat, as well as the downward pressure of the current of air set in motion by the escape of steam from under the safety valve.

In our last number is noticed a plan which we sometime ago proposed as a security to boilers, which at first sight seems very like the above, but on comparing the two it will be perceived that by our plan the safety valve would be quite removed from its seat, leaving a free passage for the escape of steam in cases of danger, while Mr. Cochaux's plan only raises the valve till the pressure is diminished.

Separating Ores.—To Thomas Petherick, of Penpellick, in the parish of Tywardreath, Cornwall, Mine Agent, "for machinery for separating copper, lead, and other ores, from earths and other substances with which they are and may be mixed, and is more particularly intended to supersede the operation now practised for that purpose, commonly called jigging," was granted on the 28th of April, and deposited in the Enrolment Office on the 28th of October, 1830.

This invention consists in certain machinery thus composed; namely, a large vat, tub, or vessel with a fixed cover, in which cover are apertures and receptacles adapted to the form and size of a number of sieves, such as are or may be used in the operation for separating copper, lead, and other ores from earthy and other substances with which they may be mixed. The vat is filled with water; the sieves are to contain the copper, lead, or other ores, together with the earthy and other substances with which they are mixed, and from which they are required to be separated. The sieves are placed in their recptacles, and thus the contents of the sieves will be immersed in the water contained in the vat; the interior capacity of which must communicate with the interior capacity of a hollow cylinder, into which a corresponding plunger or a piston is fitted, which is to be moved alternately up and down within such hollow cylinder so as to alternately displace water therefrom, and force the same into the vat, and then withdraw water from the vat into the hollow cylinder, in order that the water in the receptacles wherein the sieves are partially, and the contents of the sieves, are wholly immersed, may be alternately raised and lowered with a sudden flux and reflux, which is repeated and continued until the required degree of separation of the ores from the earthy and other substances, with which they may be mixed is effected.

The construction of the machinery, and the magnitude and arrangement of the parts thereof, may be greatly varied, in manner hereafter mentioned; but the drawing represents the combination or construction of the different parts of the apparatus, such as has been recently used for separating the copper ores obtained at the Lanescot Mine in Cornwall, from the earthy and other substances with which they are mixed, and which machinery, as far as the same has been applied, the patentee has found to supersede the operation commonly called jigging.

Fig. 1, Plate XIV. is a vertical section of the apparatus: fig. 2 a plan showing the top of the large vat, with the eight holes for the reception of the sieves. *a a a* are the sieves containing the ores to be cleaned; *b* is a moveable plunger or short cylinder, which is made smooth and true in the outside that it may work water tight in a hollow cylinder fixed in the centre of the cover. *c* is a door fitting water tight, used for clearing out the small fragments of ore and earthy matter which pass through the sieves during the operation of separating. The supply of water to the apparatus, which is conveyed from an elevated column, is regu-

lated by a valve cock. Arrangements are provided by a lever of changeable length to vary the length of the piston, and by the intervention of gearing to vary its speed from 60 to 150 strokes per minute.

As to the extent of the reciprocating motion to be given to the piston and the rapidity of the alternations, they must be varied according to the nature, size, and form of the fragments of ore and of the earthy and other substances with which they may be mixed, and also the quantity operated upon at a time, as well as the specific gravity of the waste compared with that of the ore. For these reasons no specific rule can be given for such variations, as they can only be regulated by the persons using the apparatus; but it may be observed, that the length of the stroke and the number of strokes per minute, must be so regulated as to give that rapidity of flux and reflux to the water through the sieves, as will produce such an effect in separating the ores from the waste, as is produced by boys in jigging ores by hand: but generally a requisite degree of separation can be obtained by giving a greater extent and rapidity to the motion of the water through the sieve than could be effected by hand. The patentee has found that to be the case in the application of his apparatus to the separation of copper ores from waste, at the Lanescot Mines in Cornwall.

The apparatus being supplied with water and the piston put in motion, it is evident that the water will be forced to ascend through the bottom of the sieves when the piston is depressed, and to descend again when the piston is raised; by which is obtained a washing operation precisely similar to that performed by the jigging boys, with a sieve in each hand, subjecting the ores in the sieves to rapid succession of plunges into water.

Paper Making.—To John Wilks, of Blue Anchor, Bermondsey, Surry, Engineer, Millwright, and Machinist, (one of the co-partners in the firm of Bryan Donkin & Company, of the same place, Engineers, Millwrights, and Machinists,) for "an improvement or improvements in a part or parts of the apparatus to making paper by machinery," was granted on the 29th of April, and deposited in the Enrolment Office on the 24th of October, 1830.

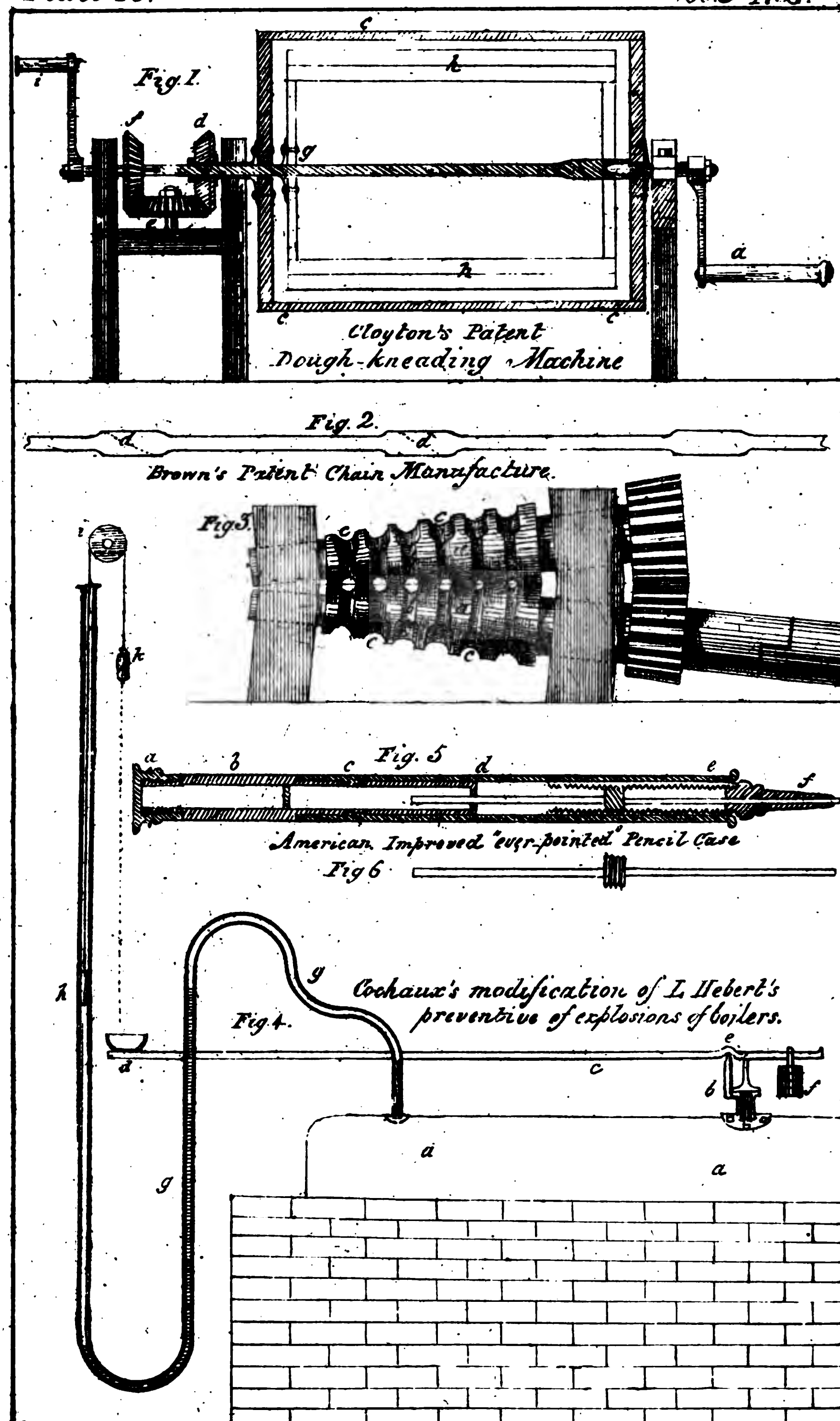
The improvement contemplated by this patentee is, the application of an additional roller to the machines used in the manufacture of paper, and known by the name of Fourdrinier's paper machines. The additional roller is to be perforated, and it is

intended to facilitate the escape of the water from the pulp web, previously to its being subjected to the pressing rollers. Still more to facilitate the abstraction of the water Mr. Wilks proposes to employ the pressure of the atmosphere, by making a vacuum within that part of the perforated roller on which the paper web rests.

The method of making these rollers is described to consist of the following processes: A piece of sheet copper, brass, or other suitable metal is bent and soldered in the form of a tube, whose length is equal to the circumference of the intended roller, and whose circumference is equal to the length of the intended roller, making an allowance for the waste at the ends. The tube is then to be drawn on trebletts, in the usual manner, and afterwards turned truly cylindrical on the mandril on which it was drawn. A series of grooves, eight or ten in number, are then turned half through the tube, with a tool the sixteenth of an inch wide, and so made as to make the bottoms of the tubes as wide as their tops. The tube is then taken from the mandril, cut open, and bent inside-out and soldered in the form of another tube, whose length shall correspond to the circumference of the first, thus constituting a hollow cylinder with longitudinal grooves inside. It is to be again drawn and turned with grooves to the amount of twenty-four in the inch, these will of course cross the other at right angles, and being cut half through as before, the entire surface will be composed of transverse ridges and rectangular perforations.

When it is desired to employ the exhausting principle a second perforated cylinder is introduced within the first. The inner cylinder must be made smooth inside, that it may fit air tight upon a sectoral cavity extending from the axes to the circumference, enclosing about an eighth part thereof, opposite to the place covered by the web of paper as it passes over the roller. The air is pumped from this cavity through the axis, which is made hollow for that purpose, by an air pump of the usual construction. When this method of abstracting the water is employed the roller must be put in motion by a train of wheel work, so arranged that it may coincide precisely with the motion through the machine.

Dough Making.—To Edwin Clayton, of Bridlesmith Gate, in the Town of Nottingham, Baker, "for an improved mode of manufacturing dough or paste, for the purpose of making it into bread," was granted on the 31st of August, and was deposited in the Enrolment Office, the 31st of October, 1830.



Drawn on Stone by L. Hebert

Decr. 1830

The nature and operation of the apparatus for making dough, patented by Mr. Clayton, will be at once understood by inspecting fig. 1, Pl. XIII. where *a* represents a handle connected with the axis *b*, which supports and turns the close cylinder *c c*, in which there is an opening for admitting the ingredients and taking out the dough when made. *d* is a bevil wheel attached to a hollow axis *g*, by which one end of the cylinder is supported. The vertical bevil wheel *d* turns a horizontal one *e*, and that turns in a contrary direction, another vertical bevil wheel *f*, fixed on an axis passing through the hollow axis *g*, supports a set of agitators *h h*, which are turned by means of the bevil gear *d e f*, in a direction contrary to the motion of the cylinder; and these two simultaneous and contrary motions constitute the novelty claimed by the patentee; who states, that dough making machines, similar to his own, have all failed for want of such an arrangement.

Cropping Grass.—To Edwin Budding, of the Thrupp, in the parish of Stroud, Gloucester, Machinist, for "a new combination and application of machinery for the purpose of cropping or shearing the vegetable surface of lawns, grass-plats, and pleasure-grounds, constituting a machine which may be used with advantage instead of a scythe for that purpose," was granted on the 31st of August, and deposited in the Enrolment Office, on the 31st of October, 1830.

The idea of Mr. Budding's invention seems to have been taken from the rotatory cutters used in cropping woollen cloth. The apparatus consists of the following principal parts,—a horizontal cutter or scythe, which is moved along the ground with its sharp or cutting edge forward. Immediately in front of this is a drum, with a number of spiral cutters, with their cutting edges coming in contact with the cutting edge of the horizontal scythe. A rapid motion is communicated to the cylinder with the spiral cutters by means of a roller, on which the apparatus is supported and moved.

On the axis of this roller is fixed a large spur wheel, which turns a pinion on the axis of a second large spur wheel, and this through the medium of a second pinion on the axis of the cutter cylinder. A solid iron roller is placed immediately behind the horizontal cutter, to regulate its distance from the ground, and the whole is supported in a cast-iron frame, to which is attached two handles, that it may be moved like a wheel barrow. It is stated, that the work performed by this apparatus is far superior

to the mowing operations of the common scythe, as no marks of the cutters are to be seen after the operation has been performed.

IMPROVEMENT IN WATCHES,

Being an Account of a new Metallic Alloy for the Pivot Holes of Watches.

By Mr. J. Bennet, of Red Lion Street, Holborn.

In a machine so minute and complicated, and requiring such exactness of movement, as a watch, it is evident that whatever tends to increase or overcome the friction of the different parts, deserves careful and serious attention. At no part of a watch or clock is the quantity of friction of greater consequence than at the pivots, and the holes in which they work. The former are required to be smooth, properly proportioned, and also to be hard, to admit of being as slender as possible; and the latter should be made in such a material, as will generate the least possible friction, be hard enough to prevent the side pressure of the pivot from altering the shape of the holes, and be acted upon as little as possible by the acids, that the oil may be preserved in a pure state.

When watches were first invented, the holes in which the pivots worked were made of brass, and the plates were polished. It was found that the plates tarnished, from the action of the air, and rendered the general appearance of the watch very unsightly; and that the oil in the holes had a tendency to become impure from the action of *acids* on the brass. Gilding the plates was then resorted to, but with these disadvantages; it softens the plates, and, consequently, the holes; and the nitric acid, mercury, &c. used in gilding, has a very injurious effect on the pivots and oil. Both of these methods having their advantages, and disadvantages, it is difficult to say which is the better of the two.

Ruby, or garnet holes, were then substituted for brass holes; and, by many, these have been considered the *ne plus ultra* of this part of watch-making—a watch being considered valuable in proportion to the number of holes it has jewelled. But experience proves, that when a hardened steel pivot works in a ruby, or garnet hole, the friction may, from a variety of circumstances, be materially increased, instead of diminished by the hole. If it were possible, in *every case*, to have the two surfaces of the steel pivot and ruby hole perfectly smooth, the friction would be but trifling; but it is often very difficult to obtain this, even in the best jewelling. If there should be but the smallest imaginable part of the ruby hole unpolished, the action of that unpolished part on the pivot would be precisely the same as a common grindstone on a chisel or knife; consequently, there would be two rough surfaces rubbing each other, and, thereby, the friction

would be very much increased; and ultimately the pivot, being the softer of the two, would be destroyed. The pivots which are nearest the maintaining power, and the balance staff, especially if the balance be heavy, are most affected by bad jewelling, by reason of the greater side pressure they sustain. From this cause proceeds the harsh rubbing sound of the balance staff observable in some jewelled watches. Hence, many of the most eminent watchmakers jewel only in the staff and scape wheel holes. Those who have been accustomed to repair watches with a number of holes jewelled, will have had abundant evidence of the trnth of these observations. Mr. Bennett mentions two instances, out of a great number, which came under his observation, as, in them, the objection of bad jewelling, in the ordinary sense, could not be reasonably brought. He repaired, in November, 1829, a celebrated watch given to H. Brougham, Esq. M. P. by the working watchmakers of Liverpool, which is jewelled in every hole. As it is considered to be a specimen of the finest work the art of Liverpool could produce, it is fair to suppose that they would pay particular attention to the jewelling, which certainly is very valuable, both as regards the fineness of the stones, and the beauty of the workmanship. He found that every one of the pivots were cut and threaded by the jewelling, but more especially those nearest the maintaining power; and the polished surfaces of the pivots having been worn off by the roughness of the jewel holes, the dirt, &c. which the oil had collected stained the pivots as black as ink. Now, a watch in this state, is infinitely worse than one with common brass holes, as the only remedy is to have new pivots and holes, the expense of which would be almost equal to that of a new movement; not to mention the gradual increase of friction and consequent continual change in the rate of performance of the watch. The other instance, was a very superior carriage watch, by Tregent, made for the late Duke of Kent, and now in the possession of the Duke of Sussex, in which the staff pivots were nearly cut through by the jewel holes, it having a *very heavy balance*. This illustrates a foregoing observation, that, in proportion as the side pressure the pivots sustain is greater, jewel holes tend, *above any other*, to increase the friction. A new staff was put to this watch, and the same process went on.

Watches have been made with steel holes, but these have never answered the purpose, for several reasons; principally, on account of the constant liability to attraction, between the pivot and hole from magnetic influence, the friction caused by two metals of the same kind rubbing each other, and the disposition to oxidize.

Gold has also in some cases been used, but, by reason of its softness, it is objectionable both on account of the side pressure of the pivot, and the difficulty of getting a perfectly round hole.

What appears to be wanted to obviate the objections to which the holes above mentioned are liable, is, to obtain a *metal* that

shall preserve the oil in a pure fluid state, be subject as little as possible to friction, and be *softer* than the pivot, for, it is of more consequence to preserve uninjured the pivot than the hole. Mr. Bennett tried various metals both simple and compound, to procure one having these advantages:—

Platina he found objectionable on three grounds; viz.—difficulty of working;—deteriorating effect upon the oil;—and too soft to bear the side pressure of the pivots.

An alloy consisting of 3 dwt. of pure gold, 7 grains of silver, and 8 grains of steel, proved too brittle, and to possess a very coarse grain. Another alloy, prepared nearly similar to the foregoing, but having the addition of 3 dwt. 18 grains of platina, and 1 dwt of copper, was found to have analagous properties.

A compound of 1 dwt. pure gold, 1 dwt. copper, ½ dwt. silver, and 6 grains zink, proved very malleable, was nearly as hard as brass, and produced much less friction.

The following alloy, however, proved eminently successful; viz.—3 dwt. of pure gold, 1 dwt. 20 grains of silver, 3 dwt. 20 grains of copper, and 1 dwt. of palladium. The palladium readily united with the other metals, and the alloy fused at a temperature rather below that required for melting gold in a separate state. It was very nearly as hard as wrought-iron, and not so brittle but that it could be drawn into wire. Its colour was a reddish brown. Its grain on breaking as fine as steel. It takes a very beautiful polish; and the friction with steel was very much less than that of brass and steel, or the previously mentioned alloy with steel. It works well. Nitric acid has no sensible effect upon this alloy. Mr. Bennet has constructed a watch, and made the holes of this metal, and it answers fully his expectations, as regards its degree of hardness, its suffering the oil to remain in a pure fluid state, and its little susceptibility of friction. It produces much less friction than the jewel hole, especially supposing the jewel not to be perfectly well polished; besides that, it will not *wear the pivot* nor be effected by the acid particles which may be contained in the oil. And with regard to expense, it has a decided advantage over the jewel hole,—as the expense of jewelling all the holes of a watch would be from £6 to £9, whereas the same number of holes may be made of this metal for as many shillings.

SPECIFICATION OF AN AMERICAN PATENT.

Specification of a Patent for an Improvement on Mordan's ever-pointed Pencil Case. Granted to Joseph Saxton, *Philadelphia, Pennsylvania, April* 11, 1829.

The old construction of the ever-pointed pencil case, on which

said improvement is made, consists of a cylinder that slides inside of a case similar to those used for the ordinary cedar pencils, and may be slid in or out in the same way, being connected with the outer slide of the case by means of small pins or screws. Through the cylinder is cut a left-handed female screw, in which acts a male screw, to which is joined the small wire that propels the lead. Part of this screw is filed away, so as to form two flat surfaces, in order to slide in a slit cut in a second cylinder, fitted exactly into the first, and made to extend a short distance above it. To the upper end of this small cylinder is fastened a collet, which projects over the end of the larger one; and while it permits this larger cylinder to revolve freely on the smaller, prevents the latter from drawing out. The lower end of this smaller cylinder projects a sufficient distance below the other, to be held between the fore finger and thumb of the left hand, and inasmuch as the small screw passes through the slit in this cylinder, it cannot turn but as it acts in the thread of the outer cylinder which revolves by turning the case, this screw, to which the propeller is attached, must move either up or down, according to the way in which the case is turned.

The improvement on the above-described pencil case, for which alone a patent is claimed, consists, first in screwing the point through which the lead is propelled into the first described or outer cylinder within the case, to which the external slide is attached, instead of the inner or second above described cylinder, thereby making but one sliding joint between the point and outer tube or case. Secondly, in simplifying it by continuing the female screw in said cylinder its full length; so that the male screw of the propeller may act in the same thread into which the point screws. Thirdly, in causing the propeller to move by means of a piece of square wire attached to the upper part of the screw, whereby said screw is left whole, and the thread continued all round; whereas in the other more than one half of the screw is destroyed by flattening the sides, leaving but a small proportion of the thread to project out of the slit in the second described cylinder. By this new arrangement of the parts but one cylinder is required, which must be made of a size that will slide accurately in the outer tube or case. In this cylinder the propeller works by its screw made to fit in that of the cylinder. The upper or square end of this propeller must be rather more than double the length of the point through which the lead passes, so that it may always be within the square hole in the lower end of a tube above it, and within the outer tube or case. In the upper end of this tube is fitted a plug, having one end fastened to it, and after fitting a collet or band that shall revolve on this plug, the other end is to be fastened permanently to the first or upper section of the outer tube or case; and this collet is then to be secured either by screw or otherwise to the inside of the upper end of the second section of the outer tube or case, which will prevent the inner tube or key that turns the propeller, from having any lateral motion; but will permit it to revolve with the upper part of the case to which it is connected; and by turning which (the lower section being held firm,) the propeller will

move either up or down. It is for the above new arrangement and simplification of its parts, by which a cheaper, more convenient, and durable instrument may be formed, that I claim a patent for a new and useful improvement on Mordan's patent ever-pointed pencil case.

JOSEPH SAXTON.

Description of the Drawing.—Fig. 1, Plate XIII. a longitudinal section of the case.

Fig 2. The propeller, with its screw; the upper part of the propeller being formed of square wire.

A. Cap which screws on and closes the chamber for the spare pencils, and retains B in its place.

B. The part which is to be turned round to advance the pencil.

C. Collet which is soft soldered to the outer tube, but allows the inner tube or plug to revolve when the part B is turned.

D. The lower end of the brass tube or plug, with a square hole in a piece which closes its end, through which the propeller slides.

E. The slide which retracts the point F, which point is screwed into the sliding tube; within this the female screw is shown, and the male screw of the propeller.

Mr. Philip Garret, Watch Maker, of Market Street, Philadelphia, is the proprietor of the above patent, and manufactures the cases.

ON VARIOUS IMPROVED PASTES AND LUTES.

By THOMAS GILL, ESQ.

Bookbinders' Paste of Wheaten Flour and Alum.—The bookbinders are in the habit of making a considerable quantity of paste at once, and it takes a long time to incorporate the wheaten flour and the water together in the usual manner of doing it; Mr. W. H. Kelly, our bookbinder, has, however, greatly shortened this time, by adopting the following improved method. He first mixes the flour with cold water, to the consistence of thick batter; then, having a measured quantity of water boiling hot, in a tea kettle, in which a proper quantity of alum had been dissolved, by putting it into the water cold, and boiling it, he adds a little of this boiling alum water, by degrees, to the batter, stirring it well in, till he sees the effect it has produced on the flour, by a change in its appearance, when he suddenly pours the remainder of the boiling water into it, and also stirs it well all the while. In this way he soon makes the whole into paste; whereas, on the old plan of mixing it with cold water, and then boiling it, it occupied a whole day in breaking down the lumps which formed in it.

Lute or Paste of Albumen and Wheaten Flour.—The Editor lately found an ingenious copper-smith fitting together the inside joints of a distilling apparatus, by putting between the shoulders of them stout hempen cloths, coated on both sides with a thick mixture

of wheaten flour and the whites of eggs, (albumen,) made in the cold. In this judicious way, and without tainting the flavour of the alcoholic liquors, to be distilled in the apparatus, he employed a lute, which, instead of dissolving in the hot vapours, on the contrary was hardened by them. He employed a thick mixture of white lead ground in oil to coat the exterior of his joints as usual.

The late Mr. Samuel Varley's Chemical Lute.—This consisted of wheaten flour, mixed with cold water, to which he added a portion of common salt. On applying a little of this lute, either to close the joints, or to stop the issue of vapours in distilling, the heat instantly acting upon the flour changed it into a thickened paste, which had the desired effect. As, however, it might have been difficult to unlute the apparatus, after the operation was finished, so the salt was added to the lute, by way of introducing water into it, to soften it.

Paste of Wheaten Flour and Rosin.—A German manufacturer of ladies' work boxes, jewellers' trays, &c., was in the habit of lining them with morocco leather, velvet, or paper, with a paste composed of wheaten flour mixed up with water, and boiled; and whilst boiling, he incorporated a quantity of black rosin with it, which greatly improved its strength, and prevented it from being so easily effected by moisture. He finished it by straining it through a coarse cloth, and thus removed all the lumps in it.

Paste of Wheaten Flour and Wax.—A Mr. Mayhew informed the Editor of this improved paste, many years since, and which he made in the following manner. After boiling a mixture of wheaten flour in water, to form a paste as usual, he stirred a piece of wax candle round in it a few times, and which, mingling with the paste, greatly improved its binding quality. The Editor made some of it, and found it to have acquired a saccharine taste, from the union of the wax with the flour.

Paste of Bean Meal.—Mr. Boyle Godfrey, in a chemical work published by him many years since, says, that a paste composed of bean meal and water, may be usefully employed in closing letters, and that such closures cannot possibly be loosened by directing the steam of boiling water upon them, as would be the case when the ordinary wafers were so treated.

Clay's Paste of Wheaten Flour and Gelatine.—The paste by which the sheets of whited-brown paper were so firmly held together, in the celebrated Clay's of Birmingham, japanned paper tea trays, &c. was a composition of wheaten flour and carpenter's glue boiled together. Each sheet of paper was united singly to the others by this paste, the air being carefully driven out from between them by wiping with a coarse cloth from the centre towards the sides; and they were carefully dried in stoves, after the putting on of each layer. Thus combined, they might be sawn, planed, nailed, and glued together, in the manner of wood; but the articles were much lighter and stronger, when japanned, than if formed of wood.—*Technological Repository.*

EXPERIMENTS ON THE FRICTION AND ABRASION OF THE SURFACES OF SOLIDS.

By George Rennie, Esq., F. R. S.

[Abbreviated from the Transactions of the Royal Society.]

The paper now offered to the consideration of the Royal Society, comprises the results of part of a series of experiments undertaken in the year 1825, with a view to determine the measure of the retardation of bodies in motion, when affected by the attrition of their surfaces, and by mediums of different densities.

From the attention that has hitherto been paid to this important branch of mechanical science, and from the many elaborate dissertations and experiments that have appeared at different periods, it would naturally be concluded, that the subject had been so fully elucidated, as to admit of little, if any further, investigation: but the diversity of opinions still prevalent among philosophers, and the difficulty of reducing to a satisfactory state the doctrines already advanced, incline me to the opinion that the subject is as yet but imperfectly understood. This may be attributed, in a great degree, to the very defective state of our knowledge of the properties of materials, and the difficulty, or rather impossibility, of subjecting them to geometrical mensuration. The science of mechanics considers forces as reduced to the simple questions of mathematical analysis, without regard to the properties of matter, or the phenomena incident thereto: but in rendering forces sensible, we are necessarily compelled to make use of agents, or intermediate bodies, termed machines, the employment of which in transmitting motion, in modifying its action, or in restoring the equilibrium between forces of different intensities, constitutes the object of every mechanical operation. The solution of this question, therefore, involves the conditions of equilibrium, both of simple and compound machines; the transmission of motion under different circumstances; the construction and combination of the different parts of machines, and the properties of the materials of which these parts are composed.

On a former occasion an attempt was made to develop some of the properties of solid bodies in resisting the action of a disruptive force,* the measure of which was represented by the sum and qualities of the particles displaced. The connexion may be traced, in the present inquiry, which relates principally to the resistance arising from the displacement or rupture of the superficial asperities of bodies in motion when brought into contact by extreme pressure, and is analogous to the cohesive state of a body acted upon by opposite, but contrary forces. But the cases investigated by experimentalists have seldom been carried to the extent necessary to produce a disrupture of the prominences, being generally confined to the definition of friction as designated by writers on mechanics, to be the force expended in raising continually the surface of pressure by an oblique

* Experiments on the Strength of Materials.—Philosophical Transactions, 1817.

action; the surfaces being represented by a series of inclined planes acting against each other in alternate succession. The measure of friction, therefore, being supposed, to depend upon the angles of the prominencies and the elementary structure of the bodies, the effect of polishing could only be to diminish those prominencies without altering their curvature or inflections. The expense of force, therefore, ought still to remain the same in both cases.* In this hypothesis it is reasonable to concur, experiment proving, that the amount of friction bears immediate reference to the elementary structure of bodies; and although the doctrine of inclined planes admits of a ready comprehension of the causes of this kind of resistance under certain circumstances, a very slight investigation of the nature of the bodies themselves will exhibit their asperities under every possible configuration. The amount of resistance will depend upon the degree of pressure, the approximation, or rather the engagement of the asperities and concavities, and the nature of the surfaces of which fibrous, soft, or hard bodies, are composed. To surmount, bend, or detach these asperities, under the circumstances of pressure, area, and velocity, demands a proportionable exertion of force; and it is by the determination of this force under all cases, that we can alone arrive at an estimation of the performance of machines.

The nature of friction has excited the attention of most of the writers on mechanics, from the period of the first two dissertations of Amontons, in the year 1699, down to the more elaborate researches of Coulomb and Vince, in 1779 and 1784. Amontons was the first that attempted to develop and reduce theory to calculation. He affirmed that friction was not augmented by an increase of surface, but only by an increase of pressure;† and in a subsequent paper, illustrated by some experiments on wood and metals pressed by springs of known intensity, he drew similar conclusions, with the addition that friction was one-third of the pressure, and that the amount was the same both with wood and metals when unguents where interposed. He likewise concluded, that friction increased or diminished with the velocity, and varied in the ratio of the weight and pressure of the rubbing parts, and the times and velocities of their motions. These hypotheses were adopted more or less by most of the philosophers after Amontons, but particularly by De la Hire,‡ who satisfied himself by several experiments, of the truth of Amonton's conclusions; but they were questioned by Lambert, although without the test of experiment. Parent suggested an investigation of the subject in his proposition of the spheres, and by determining the angle of equilibrium, at which a body resting on an inclined plane commenced sliding. And the celebrated Euler, in a very elaborate paper,‡ conceived it to depend upon the greater or less approxima-

* Leslie's Experimental Philosophy.

† Sur la Force des Hommes et des Chevaux, et de la Resistance causé dans les Machines.

‡ Mémoires de l'Academie des Sciences. ‖ Ibid.

tion of the asperities of the surfaces brought into contact by pressure, the resistance to which he allows to be one-third of the pressure; the same as Amontons. Of the effect of velocities, he was, however, uncertain: but observed that when a body begins to descend an inclined plane, the friction of the body will be to its weight or pressure upon the plane, as the sine of the plane's elevation to its cosine, &c. But when the body is in motion, the friction is diminished one-half. Muschenbroek and others maintained that friction increased with the surface; and Bossut distinguished it into two kinds; the first being generated by the gliding, and the second by the rolling of the surface of a body over another: and remarked, that it was effected by time, but that it neither followed the ratio of the pressure nor the mass. Brisson* attempted to construct a table of co-efficients, to denote the value of the friction of different substances; but they are inapplicable to practical purposes, for want of proper experiments. Desaguliers considered the nature of friction with a good deal of attention, but principally with reference to the rigidity of cords. He, however, quotes the experiments of Camus as best calculated to illustrate the subject; nevertheless, they were made on too small a scale to derive any satisfactory conclusions. Schober and Meister conincided with Muschenbroek in the opinion, that the spaces where as the squares of the times in the case of a body uniformly accelerated. The opinions of many other eminent philosophers, such as Leibnitz, Varignon, Leupold, Bulfinger, Daniel Bernoulli, Ferguson, Rondelet, Gregory, Leslie, Young, Oliver,† &c. might be quoted. But it is to Coulomb principally that we are indebted for the knowledge we possess of this kind of resistance.

In the year 1779 the Academy of Sciences at Paris, being desirous of rendering the laws of friction, and the effects resulting from the rigidity of cords, applicable to machines, Coulomb undertook, in the arsenal at Rochfort, a very extensive series of experiments, which he afterwards published in 1781, under the title of "Théorié des Machines simples, en ayant égard au Frottement de leurs Parties, et à la Roideur des Cordages."‡ The memoir is divided into two parts. The first treats of the friction of surfaces gliding over each other, and the second enters into an examination of the rigidity of cords, and the friction of the rotary movements of axles.

The treatise of Coulomb is illustrated by a great variety of interesting experiments, and forms the most valuable work we possess on the subject.

In the year 1784, Dr. Vince endeavoured by some very ingenious experiments, to determine the law of retardation, together with the quantity, and the effect of surface on friction. The results were, that the friction of hard bodies in motion was a uniformly retarding force, but not so with cloth and woollen, which were found in all cases to produce an increase of retardation with an increase of velocity.

* Brisson, Traité de Physique.

† Sur les diverses Espèces de Frottements, &c. (not published.)

‡ Memoires des Savans Etrangers, tome 163 and 333.

Dr. Vince's conclusions regarding the laws of retardation were partly confirmed by the late ingenious Mr. Southern, of Soho, who, in a letter to Dr. Vince in 1801, communicated the results of several experiments on the surfaces of the spindles of grindstones moving with great velocities; when it was found that with the rubbing surfaces moving at the rate of 4 feet per second over a length of surface of 1000 feet, the resistance arising from the friction of 3700 lbs. of matter, only amounted to one-fortieth of the weight.

In the year 1786, and subsequently, the late Mr. Rennie made several experiments on the friction and resistance of heavy machinery. The results varied under different circumstances; but it appeared that an augmentation of resistance took place in proportion to the quantity of machinery put into action. In one instance, in the ratio of 1 to 5, when it absorbed from one-fifth to one-tenth of the power expended.

This anomaly, as compared with the ratio of surfaces in the present experiments, can only be accounted for, from the irregularity of the movements and the difficulty of producing simultaneous actions in complicated machinery; the more especially as the results were affected by contingencies which could not be properly estimated; some of the elements on which the deduction is founded not being stated. The resistance was likewise increased by reversing the direction of motion. The velocities being very moderate, and hardly exceeding 120 feet a minute, appeared to have had no influence: but the experiments related principally to the resistances produced by different kinds of machinery.

The experiments of Morisot on the grinding and polishing of stones, and of Masiel and Pasley on the pressure and equilibrium of earths, present some interesting results; but it is only recently that our knowledge of the subject has been materially enlarged.

The agitation of the canal and rail-road question in the years 1824 and 1825, and the invention, or rather revival, of a mode of applying steam in lieu of animals to carriages on rail-roads, led to the most extravagant conclusions: and although the doctrines of Coulomb and Vince, relative to the equality of resistances under different velocities, have been still further confirmed by the experiments of many able persons in this country, such as Chapman, Grimshaw, Wood, Tredgold, Palmer, Roberts, and others, and much valuable information elicited;—our progress in the science has been but slow and unsatisfactory. Sensible of these defects, and being unable to profit by the valuable treatises subsequently published, it occurred to me that a series of experiments founded on the omissions of former writers would be extremely desirable.

The present series of experiments relates to the friction of attrition. This branch of the science comprehends the resistance occasioned by solid bodies,—such as ice, cloth, paper, leather, wood, stones, metals, &c. gliding over each other simply, or by the intervention of semi-fluids or unguents, such as oil, tallow, &c.

The object has, likewise, been to determine the powers to resist abrasion under the circumstances of surface, pressure, and velocity. Examples have been sought.

1st. From ice, by the resistance of its surface to sledges, skates, &c.

2nd. From cloth, by its remarkable properties of resistance in opposition to the law observed by solids.

3d. From leather, by its great utility in the pistons of pumps, &c.

4th. From wood, in its application to pile driving, carpentry, launching of ships, &c.

5th. From stones, as relating to the equilibrium of arches, and buildings. And,

6th. From metals, from their universal application to machinery; but more particularly to wheel carriages and rail and other roads, on which a great many experiments have been made.

Experiments on a great scale, however, frequently involve so many contradictions, from the difficulty of obtaining the necessary elements, that I have deemed it preferable to offer the present series, as comprehending in a greater degree most of the cases in question, and affording a more systematic view of the nature of the investigation.

[To be concluded in our next.]

ON THE USE OF ALUMINA WITH PIGMENTS DESIGNED FOR THE PALLET.

By A. A. Hayes, Roxbury Laboratory.

In preparing his paints, by levigating pigments with oil, the artist is often perplexed by the diversities which they exhibit after this operation. Some pigments present a chemical combination with the oil, while others can be suspended in it only by considerable labour, and soon separate when left at rest. These differences can be rendered of trifling importance, by employing such a substance as will retain those compounds which possess no attraction for the oil, in a state of uniform suspension, and whose action will be in some respects analogous to that of the gum used in inks and water-colours. The property which the hydrate or carbonate of alumina possesses, of mixing freely with oil so as to form a transparent, consistent, and almost colourless compound, admirably fits it for this purpose. At the request of Mr. Rembrandt Peale, I prepared some pigments by mixing them with alumina while moist. When ground with oil, he found them to possess all the most valuable properties of the best colours. The tendency to separate from the oil, and the disagreeable property which some colours possess, of becoming more fluid when an attempt to preserve them is made by immersing the pallet in water, disappear, after they have been ground with a small portion of alumina. The artist has it in his power thus to increase or diminish the fluidity of his paints, and to render them uniform. Some pigments become valuable as glazing colours, as the Prussiate of copper, (Hatchette's Brown). Vermilion and Naples Yellow acquire new properties.

For printing from blocks, as in the manufacture of ornamental floor-cloths, it is often desirable to increase the fluidity of the paint, so as to prevent the dropping of small thread-like parts on the work without causing it to spread. This may be accomplished by adding a small quantity of whiting to the pigment while grinding; the artisan can then load his blocks with paint, and consequently give a thick coating to the print.—*Silliman's Journal.*

ON A FINE SCARLET PIGMENT FOR THE PALLET.

By the same.

While prosecuting some experiments on the pigments employed by artists, I prepared a quantity of the bi-iodide of mercury, and gave it to Mr. R. Peale, requesting him to make some experiment on its working properties and permanency. This distinguished artist obligingly commenced them, but they were not finished at the time he left this country. He found that it readily mixed with oil; combined with other colours, it gave delicate and beautiful shades, and exposed for weeks to the direct rays of a midsummer sun, it remained unchanged. These properties induce me to recommend it as an addition to the number of pigments among which the artist can make a choice.

An economical process for preparing this salt, consists in boiling a mixture of one hundred and twenty-five parts of iodine, and two hundred and fifty parts of clean fine iron filings, with one thousand parts of rain water in an oil flask. When the brown colour of the liquid is succeeded by a light green, the clear fluid is decanted, and the residue washed with warm water; the washings being added to the green solution, two hundred and seventy-two parts of corrosive sublimate, dissolved in two thousand parts of warm water, are then added to the former liquor, and the resulting precipitate is afterwards washed and collected.

This salt either in crystals or in powder presents two distinct and beautiful colours. If the precipitate obtained as above be heated in a small subliming apparatus, or in a glass tube, it melts and sublimes copiously, and the vapour is condensed in large transparent rhombic tables of a fine sulphur yellow colour. These crystals are permanent in the air, and unaltered by the direct solar rays; but the slightest friction, or the contact of a fine point, is sufficient to alter their interior arrangement. The point of contact instantly becomes of *a rich scarlet*, and the same colour spreads over the whole surface of a single crystal, and extends to the most remote angle, if a group of crystals be the subject of experiment. This change of colour is accompanied by a sensible mechanical motion, so that a small heap of the crystals appears as if animated. An ordinary electroscope does not indicate the developement of any electricity, nor is there any considerable elevation of temperature during the change.

By gently warming the crystals supported on paper over the flame

of a lamp, the original yellow coloured salt is obtained, and the same experiments may be often repeated; affording an elegant illustration of the connexion between colours, and the mechanical structure of bodies. Transparent, but minute rhombic prisms of this salt, may be obtained by allowing a hot solution of it in a solution of corrosive sublimate, to cool very gradually.—*Ib.*

TO THE EDITOR OF THE REGISTER.

London, Nov. 11, 1830.

SIR,—I perceive that the editor of the Mechanics' Magazine, in the last number of that *disinterested* work, has promised you a few words in the next; therefore, in order that you may not be quite exterminated, (of which, however, I presume you are not much in fear, as his circle of mechanical knowledge has no apparent diameter), I have inclosed some information which will lay bare the main spring, and expose the object of his editorial lucubrations relative to the Manchester and Liverpool rail-way.

The sinister purpose is not a little aggravated by the manner in which the attempt is made to effect it; for whilst candour and impartiality are speciously professed, there is scarcely a sentence wherein the smallest credit is given to the opposite party, with which some artful and sly insinuation is not blended, to render such credit nugatory, and leave an unfavourable impression behind. If the engines of Mr. Stevenson are really so incompetent and Messrs. Braithwaite and Co's all perfection, as this *interested* trumpeter asserts, why is it that "the far-famed Novelty" and their Majesties have not yet made their debut? It is true, the poor king fell from his throne, from his head becoming dizzy at his sudden elevation on the Lankey bank; and probably the doctors have not yet pronounced his majesty out of danger from the wounds received; likewise the queen may not yet have recovered the depression of her *spirits*, consequent upon her husband's disasters, to enable her to start with eclat, although it happened so long ago as the 22nd of September: but "the far-famed Novelty" that before beat *every thing*, must be in a condition, I presume, to have resumed its proud station. I fear, however, there is "something rotten in their state", notwithstanding the asseverations of this great mechanic, otherwise he would have been more explicit in this matter. To be serious, a few journies to Manchester and back would have been much more satisfactory and far more creditable than so much puffing, of which the worthy editor himself seems almost ashamed, from the circumstance of his attaching different signatures to his remarks, as E. M. M. and J. C. R.

In requesting you to give this and the inclosed papers insertion in your Register, which you can divide to suit your convenience,

beg to declare that I am not interested in any way with the railroad in question, nor am I known to any of the parties connected therewith; but I feel that it is quite time for the mechanics of England to be apprised that they are beguiled of their support in favour of the M. M. under the specious pretext of its being "ours and for us" which these papers will prove to be a falsity, if any such proof were needed in addition to the many contained in its pages.

The copy of a paper suppressed by the editor of the Mechanics' Magazine—alias Braithwaite and Co's Magazine, with the correspondence which ensued.

"*To the Editor of the Mechanics' Magazine.*

"To Mr. Robertson, "*August*, 1830.

"Sir,—I request you to give insertion in the M. M. to the following remarks and considerations applicable to, or arising out of the case of Galloway & another, *v.* Braithwaite & another, without abridgement. As a public journalist the public have a right to expect, that in this momentous question wherein the rights of patentees in general on the one hand, and the public at large on the other, are at stake, that you will hold the scale of justice equably without favour to any party, and this I trust you will do. Neither Mr. Galloway nor Messrs. Braithwaite and Co. are known to me at all, therefore, if the truth of the case should militate severely against any party I hope I shall not be charged with being factious, vindictive, nor invidious. Some time ago I addressed a request to you, that you would give us the novelties which each of the above-named parties specifically claimed under their patents, to which their rights of exclusion are confined; this you promised to do in a subsequent number, and I am much disappointed that they have not appeared according to that promise, the probable reason of which, however, I will not now stop to inquire. For whatever that reason might be, it is right that the public should know, that there is scarcely an invention or improvement wherein there are not many things combined which were previously in use or well known, therefore public property, but which are necessary to enable patentees to carry their inventions or improvement into effect and render them useful. Now all things appertaining to an invention, whether old or new, must be set forth and described in the specification, in order that the public may benefit by the invention at the expiration of the term for which the patent is granted, this, strictly speaking, being the price the public receive for granting the monopoly; but though the *whole* must be set forth and described, patentees cannot monopolize those things that were previously in use or well known; consequently it is usual at the end of every specification, to point out expressly those things which are *novelties*, and disavow all those things which are not. The novelties thus expressly pointed out, are what are termed the *claims*; on these claims the rights of the pa-

tentees exclusively rest, and according to our present patent-laws, if any *one* thing thus expressly described as a novelty in the said claim should be already in use or well known, that particular claim is not only upset but the whole patent falls with it.

"Hence the public will see the necessity of the claims of the above-named parties being published, in order to ascertain if the public rights have been invaded. To withhold the claims can benefit no one, for if things are set forth as novelties which are not so, through ignorance of what had been done antecedently by others, an exposure is certain; therefore is it not better and far more honourable to meet the disappointment at once, than strive to bolster up such a patent by subterfuge?"

[The writer then proceeds at great length, and no less talent, to discuss the pretended novelties in Mess. Braithwaite and Ericsson's engines; but as it happens that *our* readers are pretty well informed on this subject, we feel it to be our duty not to occupy our columns further with matter of the kind, especially as the writer takes precisely the same view of the subject as we have taken in our recent numbers. It is however much to be regretted that the animadversions and corrections of ZETES were refused a place in the Mechanics' Magazine, as they would have tended to remove a great deal of gross prejudice with which the unthinking portion of the readers of that popular work have been blinded, and we should have been spared the pain of mixing our work up with a controversy which can have but little beneficial tendency.

The reasons assigned by the editor of the Mechanics' Magazine for not inserting the letter of ZETES are given in the following copy of a note sent to us for publication; the candid admission in which throws a glare of light upon the motives which have induced the numerous attacks upon us in the Mechanics' Magazine.]

Copy of MR. ROBERTSON'S *Note to* ZETES.

"The editor of the Mechanics' Magazine presents his compliments to Zetes. As the question with respect to the correctness of the remarks on the Lord Chancellor's decision in the matter Cochrane and Galloway *v.* Braithwaite and Ericsson, is one in which he is MORE THAN EDITORIALLY INTERESTED, he thinks it becomes him to decline the task of putting the objections of Zetes to them in a shape for publication. He therefore returns Zetes first paper, with that containing the proposed alterations, in order that Z. may himself do what he considers necessary. The editor must at the same time take the opportunity of stating, that he does not consider the mere question of the legality of a patent, where the patent is undoubtedly ingenious and useful, one which falls within the useful purposes of the Mechanics' Magazine; and Z. will please not to take it for granted that the pages will be open to a discussion having no real tendency*. The editor in

* If it were so—better have no real tendency, than the tendency too much of the matter has which occupies its pages.—Z.

writing his "remarks" did at first enter at some length into the consideration of a legal nature connected with both the patents, but considering, on reflection, that in so doing he was exceeding his proper province, he left out all that he had written on this head, and published only what bore briefly on the merits of the rival inventions viewed in themselves, without any regard to the law of patents. He thinks that Zetes should confine himself within the same limits, and if he will do so, his objections, however hard they may bear on the editor, shall have a prompt and ready insertion. *Mechanics' Magazine Office,*
4th Sept. 1830."

Remarks by ZETES *on the foregoing.*

In consequence of the unexpected avowal contained in this letter, of the editors connection with Braithwaite and Co.; coupled with other circumstances, as well as the editor's usual reckless and indiscriminate admission of abuse against any of his correspondents. Zetes was fully convinced that the desire of the editor to leave out the legal part of the question, arose entirely from his being interested in the patent, which he knew was a mere nullity, that would be "blasted" by exposure, and which explains the cause of his not publishing the "claims" as he promised. Zetes in consequence, transmitted to him the following reply :—

'*To the Editor of the Mechanics' Magazine.*

'Sir,—You must allow me to say that you have admitted into 'the columns of the M. M. on many occasions, what appeared to 'me to be the most groundless abuse that could possibly be levelled 'against some of your most valuable correspondents, on the plea 'of acting *independently*, and without *favour* to any *party*; which 'however has not much advanced the character of the work in 'public estimation, though it was done professedly for the public 'good. On this head I must take the liberty to digress a little. 'Every person has a right to question the opinions of another 'I most readily grant, but there are means of controverting opi'nions and arriving at truths, somewhat more creditable to the M. 'M. and its *controversal* correspondents, than by abusing any of '*those* to whom is due whatever merit that work possesses, and the 'gratitude of its proprietors for its success: for its conductors, 'excuse me for so saying, have not exhibited any distinguishing 'mark of mechanical knowledge from the commencement to the 'present time, though they have displayed considerable efficiency 'in other matters; therefore be assured, that the instant disgust 'induces their contributors to rally round some other work (a cir'cumstance by no means improbable), that instant will the M. M. 'be stripped of its main sail and become an unprofitable log. 'To return; if then matter however offensive—however injurious 'to their interest—and however unfounded as to facts, be ad'mitted without hesitation against your correspondents, on the

'plea of impartiality, I do not see upon what principle you can 'object to give insertion to the *facts* contained in my paper. 'Facts of the greatest interest and gravest importance; indeed, 'quite as much so as any mechanical question whatever can be to 'your subscribers. If you are interested as you avow in sustain-'ing a baseless fabric, surely as an editor and an honest man you 'have but one course to pursue. You will not diverge from 'right—you will not suffer your much vaunted impartiality to 'vanish on that account, but will do your duty to the public 'and your subscribers, who require it at your hands: or you will 'act in direct opposition to the precept you have laid down, 'namely—"that the public have a right to question every matter 'advanced for their benefit," and grossly unjust to those who have 'probably felt the consequence of your too often ill-judged im-'partiality. I contend that here are plans advanced from which 'it is sought to exclude the public for the personal benefit of par-'ties who have no exclusive right whatever to them. Yet we are 'not to question their legality, but smother the truth, and allow 'the public to be gulled out of their rights, because forsooth, the 'editor's *interest* has put his impartiality to flight. No no, this 'cannot be, the contents of my paper will be transferred to the 'pages of the M. M. to a certainty, if that work is to be any 'longer considered as "ours and for us," the motto around which 'every one rallied; but if otherwise, if the work is to be sur-'rendered to the purposes and interest of a party, for whom it has 'puffed rather loud and long, let the motto be expunged—let the 'exertions of its contributors cease, as it is high time for every 'one to withdraw their confidence from its pages. ZETES.'

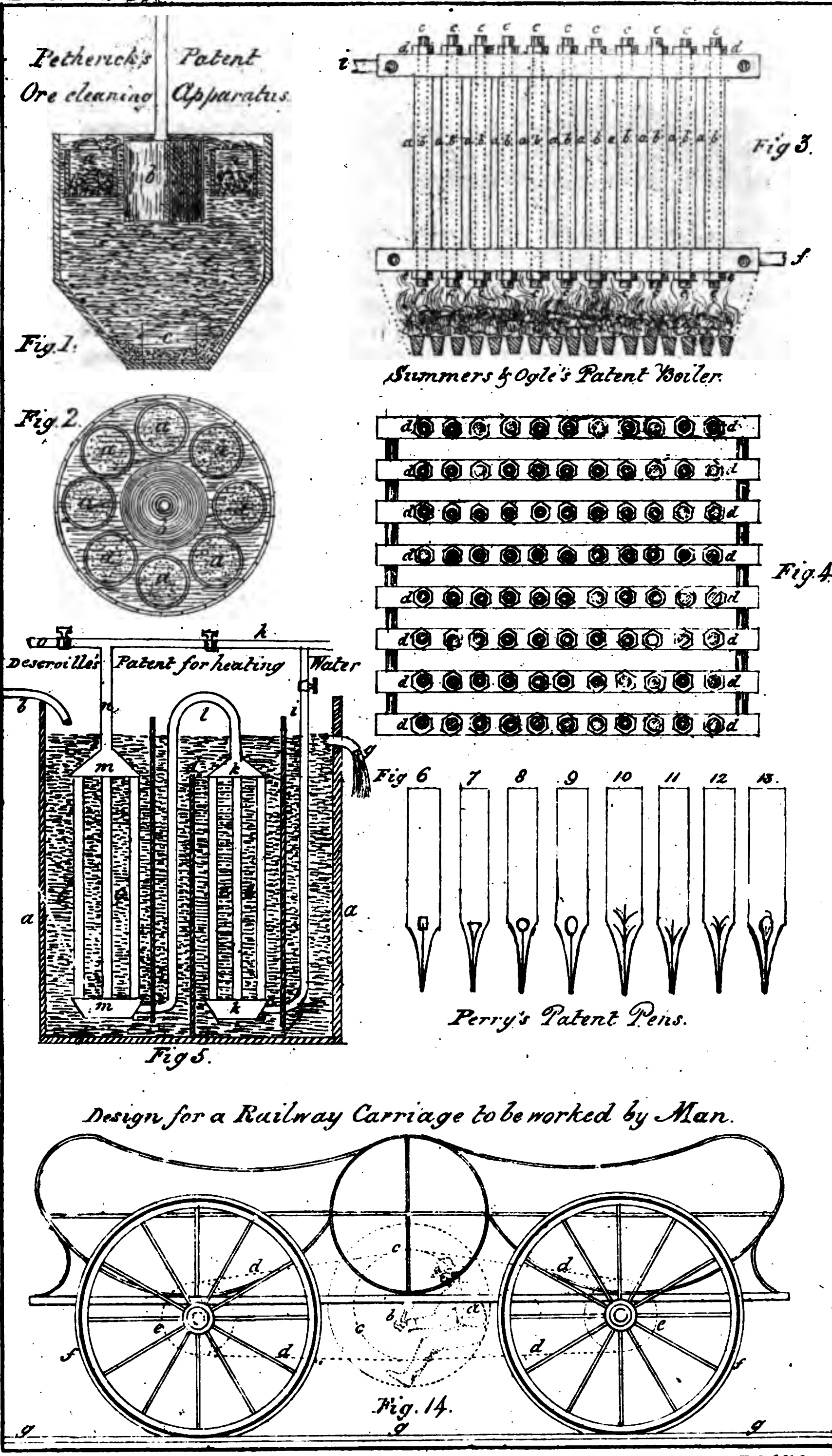
It is now nearly two months since this letter was sent, accompanied by the manuscript which was before returned, but no notice has been taken of it.

SUGGESTION FOR RAILWAY CARRIAGES TO BE WORKED BY MEN IN LIEU OF STEAM.

BY THE EDITOR.

Reflecting upon the slight resistance to the motion of rolling bodies on the Manchester and Liverpool Railway, owing to the excellent manner in which that work has been executed, it has occurred to us that if any light carriages were made on the suspension principle, they might be worked by men, with great advantage to themselves, by carrying passengers and light parcels between the before-mentioned towns.

Several statements have been published, by which it appears that the resistance on the railway in question is only 1 in 200; in other words, that a power (or descending weight) of 1 lb. is ca-



Drawn on Stone by L Hebert. Dec.r 1830.

pable of drawing 200 lbs. at the rate of 15 miles per hour. Admitting such statements to be correct, it follows that the application of a force equal to 25 lbs. weight, will propel a body weighing 5000 pounds.

In apportioning this weight to a carriage and its load, it is evidently of importance that the former should be rendered as light as possible consistently with adequate strength; and this end may be best attained by arranging the constituent parts of the frame of the carriage so as to combine them on the tension or suspension principle. For this purpose, generally, very slight iron rods, or stout wire would effect all that is now usually performed by great beams of wood, of greater amount of weight. The wheels of the carriage should be of as great a diameter as possible, say from 6 to eight feet; bearing in mind that the increase of effect from a given power is nearly in the proportion of the increased diameter of wheels. The total weight of a carriage to carry 20 passengers, might we think be made not to exceed 1500lbs.

Not to exceed - -	1500
20 Passengers (large and small) -	2500
4 Men to work carriage - -	600
Small parcels - - -	400
	5000 lbs.

Supposing the carriage thus loaded, the pay might be as follows:—

	£.	s.	d.
For 20 passengers at 5s. each - - -	5	0	0
For small parcels—400 lbs. at 1d. per lb. -	1	13	4
From Liverpool to Manchester - -	6	13	4
Back from Manchester to Liverpool -	6	13	4
	13	6	8

The expense of the two journies might be as follows:—

	s.	d.	£.	s.	d.
Interest of money for capital employed of £100 per day - - - - -	0	3			
Company's tolls, possibly as much as - -	7	0			
Wear and tear—repairs and contingency -	9	5			
			0	16	8
Possible profit			£12	10	0

as a compensation to four men for *one day's* labour! What would be the *actual* amount of compensation experience alone can determine. There are many stout, able, and civil men, who would be more than satisfied to give two hours of hard work per day for five shillings each, and this is not a twelfth part of what, it appears by the foregoing statement, they might *possibly* get by it. The

most moderate estimate of the probable profits of working such a carriage, would not, we think, be less than four pounds per day; and this is supposing such a reduced load that the labour of two men would be sufficient, which would give them two pounds each.*

At fig. 14, Pl. XIV. we have sketched a design for a carriage of this kind. At *a* is a man turning a crank *b*, on the axis of which is a drum *c c*, connected by endless straps *d d*, to pulley wheels *e e*, fixed to the axle-trees of the wheels *f f*, which run upon the rail *g g*. The curved lines of the side framing of the carriage, are intended to bestow a little elegance of form, without much loss of the strength in the essential parts that would be imparted to the trussing, if the lines were straight. Instead of a straight line to the floor, it might be slightly cambered, and trussed on the plan of Smart's bow and string rafters, described in our early volumes. By four men being employed to propel, it is intended that two should work at a time, whilst the other two rested, changing alternately to relieve each other.

Having estimated the weight of the carriage and the load together at 5000 lbs., and the force necessary to move it at the rate of 15 miles an hour, to be 25 pounds, it is necessary to inquire whether the strength of two men, exerting it for a *short time*, after similar intervals of rest, is adequate to apply that force constantly through a space equal to 15 miles in an hour.

Desaguliers informs us that a man can for a *short time* exert a force of 80 pounds, with a fly, when the motion is at the rate of 4 or 5 feet in a second; although he could not *throughout the day* exert a force of more than half that weight. Now as we propose the men to "shift" as often at least as every ten minutes, we may fairly take the 80 pounds as the basis of our calculation:—4½ feet in a second ($\times 60 \times 60$) is $=$ 16,200 feet in an hour, or rather more than three miles per hour, 1 man moving 80 pounds; it follows that two men working together will do at least twice as much, or 160 pounds at 3 miles per hour. The increase of effect by two men working cranks at right angles, instead of one man alone, is well known to be in a greater ratio than as 7 to 3, consequently we have to add one sixth of 160 pounds to that sum, making it 187 pounds moved by two men at the rate of 3 miles per hour; which is equivalent to ($187 \times 3 \div 15$) 37 lbs. moved at the rate of 15 miles per hour, according to the authority of Desaguliers, or about 1½ times the quantity of force we have considered to be necessary.

* By the wing of St. Gabriel, this is immensely better than editorial scribbling! Let us ponder over this—our pen is weak, and our arm is strong—how much easier and pleasanter it would be to turn a wheel over the Sankey Viaduct, than turn a sentence or describe a circle in our little smoky garret! We are really eager to be off, but prudence whispers us "you can do both;" our readers will therefore not be surprized if our next papers are dated—"From our Manu-motive Engine at Sankey."

FORD'S BALSAM OF HOREHOUND.*

A PATENT was granted to Thomas Ford, of Canonbury Square, Islington, Middlesex, for "certain improvements in the medicine for the cure of coughs, colds, asthmas, and consumptions." Dated August 12, 1830.

The following is the recipe for making this patent medicine, as given in the specification:

Take	3½ lbs. of the	herb horehound,
	3½ ,,	liquorice root,
	½ ,,	squill root,

to which add as much water as will infuse in a still, for six days, more or less; the quantity of the water being regulated according to the strength or quality of the horehound.

Of this infusion, or extract, take sixteen pints, with which mix

12 pints of	spirits of wine, or good French brandy.
1 oz.	gum camphor,
1¼ ,,	extract of Turkey opium,
1 ,,	gum benjamin,
4 drachms	extract of poppies,
4 oz.	salt of tartar,
8 drachms	oil of aniseed,
3½ lbs.	clarified honey,

and let the same be digested for about twenty-eight days in a close cask.

The patentee states his claim to be for the addition of the squill root, salt of tartar, and extract of poppies, to the original specification; and that although in the above directions he has mentioned the time and proportions most convenient, a variation in some degree may produce the same effects.

DEFENCE OF HOUSES.

TO THE EDITOR.

SIR,—In your third volume, present series, page 235, you have favoured us with a description of the "percussion hand grenades," invented by Capt. Norton, of the 34th regiment, (and exhibited in the "National Repository"), which are intended as a defence for houses against the attacks of robbers; and although I perfectly agree with you, that the said grenades "afford a very *of*fensive mode of making a *de*fence, and one that women and children may employ as efficiently as men," yet they are expensive, not easily procured, and of no use unless the robbers are near at hand. Some simpler and

* Omitted in our last Number among the account of New Patents.

more easily employed means of defence are desirable, for there are times, when every man, having a family to protect and provide for, should endeavour to make his house truly his castle. * * *
* * * * * * * * * * * *
If you entertain the same view of the necessity of a measure of this kind becoming general, I think you will be conferring a public benefit by devoting your inventive talents to that object for a time. I am not individually aware of any thing more potent, considering its convenience and cheapness, than the common bow and arrow, or the cross-bow, of olden time. Your ideas on this subject will oblige

A CONSTANT READER.

The subject suggested to us by the foregoing letter of a "A CONSTANT READER," is not to our taste. We had hoped that instruments of the kind he mentions required no increase, and thinking with Lucius, that "'tis time to sheathe the sword and spare mankind;" indeed we do not despair of seeing the day when most of them shall be "beaten into ploughshares, or turned into reaping-hooks;"—when machinery employed for facilitating or superseding human labour, shall be encouraged by that very class of persons who now aim at its destruction;—when the *flail* shall be regarded as a curious memento of the barbarity and ignorance of the present era.

MISCELLANEOUS.

ACTION OF PLATINA ON SILVER.—According to Lampadiers, silver when alloyed with platina, burns and volatilizes much more readily than when fused alone. The vapour which rises is oxide of silver.

STEAM BOAT EXPLOSION.—Another explosion of a steam boat has recently taken place near New York, North America, on board a boat named "The United States," on her voyage to Newhaven, which was accompanied with the destruction of human life. The following particulars are collected from the American papers. The accident occurred off Blackwell's Island—The water and steam burst forth, accompanied with cinders, pieces of brick, iron, &c., in the direction towards the bow of the boat. It appeared from the evidence of the engineer and captain, that the boiler was, a minute or two previous to the accident, ascertained to be fully supplied with water, and that the steam was not in excess. "The United States was going at her usual speed with 12½ inches of steam, she could carry 13 or 14 inches, and the boiler is so fixed that the steam blows off itself at 14 inches. The rupture took place in the lower part of the main flue, about ten feet back of the bridge wall. It closed up the flue nearly altogether. The rent is what has been hertofore termed a "collapse of the flue." The part torn up had been repaired about a week since. There were four new sheets of iron put into the flue. The new sheets were torn away, but the rivets remained in the old

sheets. There were no braces between the flue and the outer shell, through the whole length of the bottom of the boiler. The boiler is of iron, appears firm and strong, is of a cylindrical form, about 22 feet in length and 8 feet in diameter, with what are denominated "kidney flues," forming one large cylindrical, and one small return flue. It has been in use nine years; it is of the low pressure kind."

"It is a singular coincidence, that in nearly all the accidents which have occurred in our waters, the ruptures have taken place in the same part of the boiler. In the explosions of the "Constitution," the "Chief Justice Marshall," the "Legislator," the "Bellona," and the "Caroline," all low pressure boats, like the "United States" the rent was made in the lower part of the flue, which was raised upwards. In all these boilers no braces were in the bottom of the boiler. The Constitution had afterwards braces put in between the lower shell and the flue, and no accident occurred afterwards.

The Incendiary's Walking Stick.—A provincial correspondent informs us that he has reason to believe, the description given in the newspapers of the apparatus used for firing stacks and buildings, is in the main points correct; that "it is constructed on the principle of children's little guns, that discharge an arrow by the sudden contraction of a distended wire spring. It consists of a light metallic tube, about the size and length of an ordinary stout walking-stick, which it is made to resemble externally. The spiral spring, which is of stout elastic steel, occupies the whole length of the cylinder, as you may have observed in the small steel-yards, used for the pocket. This machine is either charged with an arrow or a ball. In the first case, the head of the arrow is made hollow and filled with combustible matter, that spontaneously ignites by combining with the gaseous matter of the vegetable substance it is made to penetrate, the hole through which the charge is made being left open to admit of the gaseous combination taking place."

American Rail Road.—Some experiments have recently been made on the Baltimore rail-road, by which it would appear the Americans have far surpassed Great Britain in this important mode of transportation. The "Baltimore American" newspaper tells us, that a single horse "*trots*" along the rail while dragging after him 35 tons weight! Verily there must be "something more (or less) in this than meets the eye." Either the editor means that the horse trots *down* an inclined plane, or he intends to raise a "horse-laugh" at the credulity of his readers.

Gold Mine in Georgia, United States.—A gold mine has been discovered in Georgia, (which is said to be the richest hitherto found in that State) on the land of Mr. Olrod, of Hall county, about seven or eight miles from Gainsville. It is what is called a ridge mine. The surface is almost covered with rock, all of which contains gold in greater or less quantities, which is obtained by pounding the rocks. On the 21st of September, seven hands who were employed upon it, obtained 205 pennyweights of pure gold, equal to about 180 dollars, or about 26 dollars per hand per day, This, however, appears to have been much more than the average produce of a day's labour.—*American Papers.*

LIST OF NEW PATENTS SEALED.

SADDLES.—To H. Calvert, of Lincoln, for an improvement in the mode of making saddles, so as to avoid the danger and inconvenience occasioned by their slipping forward.—Dated 26th October, 1830.—Specification to be enrolled in two months.

HOOKS.—To J. Shores, of Blackwall, Middlesex, for an improvement on tackle and other hooks, which he denominates "the self-relieving hooks." —1st November, 1830. Two months.

RUDDERS.—To J. Collinge, of Lambeth, Surrey, for an improvement on the apparatus used for hanging or suspending the rudders of ships or vessels of different descriptions.—1st November, 1830. Six months.

NEBS.—To B. Cook, of Birmingham, for an improved method of making a neb or nebs, slot or slots, in shells or hollow cylinders of copper, brass, or other metals, for printing calicoes, muslins, cloths, &c..—1st November, 1830. Six months.

CUTTING PAPER.—To L. Aubrey, of Two Waters, Herts, for improvements in cutting paper.—1st November, 1830. Six months.

DYEING.—To J. Bowler, of Castle Street, Southwark, for improvements in machinery employed in the process of dyeing hats.—1st November, 1830. Two months.

FURNACES.—To J. Nott, of Schenectady, in the State of New York, but now of Bury Street, St. James's, Middlesex, Esq. for improvements in the construction of furnaces, &c. Communicated by a foreigner.—4th November, 1830.—Six months.

LOCOMOTION.—To T. Bramley, and R. Parker, both of Mousley Priory, Surrey, for improvements on locomotive carriages, &c. applicable to rail and other roads.—4th November, 1830. Six months.

WOOL.—To A. Bell, of Chapel Place, Southwark, for improvements in machinery for removing wool or hairs from skins.—4th of November, 1830. Six months.

WHEELS.—To A. W. Gillett, of Birmingham, Warwick, for improvements in the construction and application of wheels to carriages, &c. Communicated by a foreigner.—4th November, 1830.—Two months.

METALS.—To G. Bompas, of Fishponds, near Bristol, Esq. M. D. for a method of preserving copper and other metals from corrosion or oxidation, —4th November, 1830. Six months.

FLUIDS.—To J. Gibbs, of Crayford, Kent, Esq. for improvements in evaporating fluids, applicable to various purposes.—6th November, 1830. Six months.

PAPER.—To J. Hall, the younger, of Dartford, Kent, for an improved machine for the manufacture of paper. Communicated by a foreigner.—9th November, 1830. Six months.

CHAIRS.—To G. Minter, of Princes Street, Soho, Middlesex, for an improvement in the construction of chairs.—9th November, 1830. Six months.

QUARRIES.—To H. Pratt, of Bilston, Stafford, for improvements in the manufacturing of quarries.—11th November, 1830. Six months.

ROTARY ENGINE.—To Sir T. Cochrane, Knt. of Regent Street, for an improved rotary engine, to be impelled by steam, and which may be also rendered applicable to other purposes.—11th November, 1830. Six months.

SPINNING.—To C. S. Cochrane, of Great George Street, Westminster, Esq. for improvements in the preparing and spinning of cashmere wool. Communicated by a foreigner.—13th November, 1830. Six months.

ARITHMETIC.—To J. Tyrrell, of St. Leonard's, Devon, for a method and apparatus of setting sums, for the purpose of teaching some of the rules of arithmetic.—13th November, 1830. Six months.

SPINNING MACHINERY.—To T. Sands, of Liverpool, for improvements in spinning machines. Communicated by a foreigner.—18th November, 1830. Six months.

PATENTS ENROLLED BETWEEN 10TH NOVEMBER, AND 10TH DECEMBER, 1830.

Particularizing the Offices in which the Specifications may be inspected, with the Dates of Enrolment.

Calico Printing.—To Matthew Bush, of Dalnonarch Print Field, Dumbarton, North Britain, Calico Printer, a patent "for certain improvements in machinery or apparatus for printing calicoes and other fabrics," was granted on the 24th of May, and the specification was lodged in the Enrolment Office on the 24th of November, 1830.

Three improvements are contemplated by this patentee, all having reference to printing what are denominated by calico printers, after colours. When several colours are printed upon the same piece, all except the first printing, are called after colours, and considerable manual dexterity, or great precision in machinery are evidently required, to make the successive printings precisely fit the previous printings. A principal source of uncertainty in these presses, is the unequal contractions of different parts of the same piece of calico; and to remedy this, Mr. Bush proposes to apply stretching frames, consisting of three bars, adjustable by screws, on each side of the printing table. Having thus provided the means of disposing the calicoe evenly upon the table, the patentee applies a short traversing roller for each of the after colours, with guides, to make the patterns upon its surface coincide precisely with the parts of the calico requiring the impression. A third improvement, consists in the application of a set of knockers, by which the impression is given when hand blocks are employed. Several boys, corresponding in number with the after colours to be used, are provided with seats one before another, above a print table, over which the piece of calico is drawn by machinery: during the time that the cloth is moved forward, each boy applies colour to his block, which extends the whole width of the piece; and when the calico ceases to move, then a set of knockers which are hinged to the seats of the boys, and which are elevated and rest upon projections from the seats up before the boys while they are colouring and applying the blocks, are brought down with considerable force upon the blocks to give the impressions.

All these improvements apply to calico printing machines, invented and patented by Mr. Bush, in the several years 1813, 1824, 1825, and 1827.

Paper Manufacture.—To Richard Ibotson, of Poyte, in the Parish of Stanwell, Middlesex, Paper Manufacturer, a patent for "an improvement or improvements in the method or apparatus for separating the knots from proper stuff or pulp, used in the manufacture of paper," was granted on the 29th of July, and the specification was enrolled in the Petty Bag Office on the 29th of November, 1830.

Hitherto much difficulty has been experienced in clearing the stuff or pulp of which paper is made, of the small knots, which are invariably found in it, and which if not separ ated,necessarily diminish the quality of the paper. The sieves or strainers which have been generally employed for separating the knots have been either so wide in the meshes as to permit the smaller knots to pass through, or else they very soon get clogged up, for it is evident that the fibres of which even the finest paper is made are considerably longer than one of the meshes in the sieve, and hence they will, instead of passing through, be deposited across the meshes, and immediately render the sieve useless.

To remedy these imperfections Mr. Ibotson manufactures his sieves or strainers, which he applies to the paper machines distinguished by the term Furdineer's machines, of metallic bars, giving the preference to gun-metal, made flat on the upper surface, and about half an inch wide, or at all events of a width greater than the length of any of the fibres in the pulp. The bars are strengthened by a projection extending along the middle of their lower sides, so that the cross section of one of the bars may be represented by the letter T. These bars are in a frame at a distance from each other, corresponding with the intended quality of the paper for which the sieve is to be used. He has designed however a very ingenious method of adjusting the distances between the bars, so as to make the same sieve answer for the manufacture of paper of different qualities. For this purpose he makes all the bars to taper uniformly, and fixes every alternate bar with its narrow end towards the same side of the sieve; and he frames the other bars together, but does not fix them to the sieve; they are introduced between the fixed bars with their narrow ends in a contrary direction. By this arrangement it is evident that the distances between may be diminished or increased to any degree of nicety, with the greatest facility, by pushing the frame of loose bars forwards or backwards, which is effected by means of adjusting screws. The sieve is to be placed in a trough conveniently situated to receive the pulp from the hog or

machine by which the rags a retorn to pieces and agitated into the consistence of pulp. One side of the sieve, which is made of the form of a rectangular parallelogram, is attached by hinges to the trough, and the other is connected with a set of cam-wheels, by which it is elevated and depressed with great rapidity; and when the sieve gets clogged up by the knots which it separates from the pulp, its surface is to be cleaned by a rake or brush, made of hard bristles. This seems to be a highly ingenious invention, and in the hands of a practical man as it is, it cannot fail to become useful to the public.

Cork Cutting.—To James Holmes Bass, of Hatton Garden, London, Gentleman, a patent for "certain improvements in machinery for cutting corks and bungs," was granted on the 3rd of June, and the specification was deposited in the Enrolment Office on the 3rd of December, 1830.

Mr. Bass having prepared the cork by cutting the sheets into blocks, of the length of the required cork, and of a width corresponding with the thickness of the sheet from which they are taken, fixes the blocks successively between two chucks, in a kind of lathe, by which a slow rotatory motion is communicated to them, while a frame knife is brought in contact with the circumference of the intended cork; the plane of the blade being made to coincide with a tangent to the curve. To give to the cork the requisite degree of tapering, the knife is made to approach nearer to the axis of motion at one end than the other. To the knife frame, which is supported on cams of different sizes, which are to be brought into action according to the size of the cork or bung to be cut, a sawing or slicing action is communicated by cranks and connecting rods, from the main shaft of the apparatus. As a great portion of the sheet of cork imported into this country is too thin to be cut into circular corks, of the required size for common bottles, it has been the practice of cork cutters, to make their corks somewhat elliptical, in order to save material; finding that the compression of the cork in one direction will expand it in another, and make it form, though of an elliptical shape, a perfect stopper to a circular opening. To accommodate his machine to this economical mode of cutting, Mr. Bass makes his cams which support the knife frame, of an elliptical form; and as the rotation of the cams are made to coincide with the rotation of the cork holders, the cork will be cut of an elliptical form, as they had been manufactured by hand.

The principle and arrangements of this machine are highly creditable to the ingenuity and judgment of the patentee, who will doubtless reap the benefit of his labours.

ROVING FRAMES.—To William Lane, of Stockport, in the county of Chester, Cotton Manufacturer, a patent for "certain improvements in machines, which are commonly known among cotton spinners, by the names of coving frames, or otherwise called cove frames, or bobbin and fly frames, or jack frames," was granted on the 5th of August, and the specification was enrolled in the Petty Bag Office on the 5th of December, 1830.

The principal improvement contemplated by this patentee, is the application of bobbins on which the cotton, in the progress of preparation, is wound or coiled, without end flanches to keep the coils of cotton on the bobbins; using simply a wooden tube instead of a reel for this purpose. And the advantage to be gained by this substitution, are lightness in the bobbins, for the weight and momentum of the end flanches in rapid rotation, infacilitate the removal of the cotton from the bobbin during the next process to which it is subjected. It might appear at first sight, that the mere removal of the end flanches from bobbins is so trifling an alteration, as scarcely to deserve the protection of His Majesty's letters patent; but it must be borne in mind, that other parts of the roving frame must be modified to effect the coiling of the cotton upon bobbins without end flanches; for it is evident, that each successive coil must be shorter than the preceding one, making the coils of cotton conical at each end. The alternate elevations and depressions of the bobbins must be successively diminished in extent; and to effect this object, the patentee employs tapering or wedged shaped plates, which are drawn gradually in between the stops on the rod, by which the extent of the elevation and depression of the bobbins is regulated. He also proposes, for the same purpose, a spiral wheel, and screwed bolts and nuts.

It is not a little remarkable, that Mr. Lane should have considered it necessary to describe and delineate the whole of the roving apparatus, with which his improvements are connected so minutely as to require thirteen skins of parchment for the description, and four skins of drawings: being fifteen more than are generally employed by patentees, except by the clients of one patent agent. As the additional expense of stamps alone is twelve pounds, it would be interesting to ascertain the whole expense of specifying an invention in the plan adopted by Mr. Lane.

STEAM ENGINE.—To William Tutin Haycroft, of the Circus, Greenwich, Doctor of Medicine, a patent for "certain improvements in steam engines," was granted on the 11th of June, and the specification was deposited in the Rolls Chapel Office on the 10th of December, 1830.

It has been found, as stated by Dr. Haycroft, that steam surcharged with caloric, or such as has been augmented in temperature after it has assumed the gaseous state, is exceedingly difficult to keep from passing the piston in the working cylinder, and from injuring the packing if made of hemp or similar material, as well as from carbonizing the tallow or oil used for lubricating the cylinder and piston.

The patentee having ascertained experimentally, that the elasticity and power of steam can, by the application of heat after the steam is generated, be greatly augmented with a comparatively small consumption of fuel, set about inventing an engine to be worked with surcharged steam, without its being liable to the objections above alluded to. The plan by which he proposes to preserve the piston packing and oil from being carbonized, and at the same time to prevent the high pressure steam from passing the piston on which it presses, is to keep water on the under side of the piston while the steam only acts on the upper side. This he effects by placing his boiler in a position higher than the working cylinder, and making a communication from the bottom of the boiler to the lower end of the cylinder, and from the top of the boiler to the upper end of the cylinder. The piston-rod which passes through the bottom of the cylinder, is made so thick that the square of its diameter shall be just half the square of the diameter of the cylinder, or that the area of a section of the piston-rod shall be half the area of the lower side of the piston. This being the case, it is evident that the water can only press upon half the area of the piston, the thick piston-rod occupying the other half while the steam acts upon the whole area of the upper sides; hence, when the steam passage from the top of the boiler and the upper end of the cylinder is open, the piston will be forced down with a power of two, while it is resisted by the water passage from the bottom of the boiler to the lower end of the cylinder being open by a power of one; so that it will descend with a power of one, and when it reaches the bottom, the steam communication is stopped off while the steam, now in the cylinder, is allowed to escape through an eduction valve; when the piston will ascend by the pressure of the water below it, with a power of one, or the

same with which it descended. When the piston reaches the top of the cylinder, the steam passage is again opened and the eduction cock closed, when it will be forced down as before; and thus a constant and uniform action is obtained by the action of water on one side of the piston and the action of steam on the other. When it is inconvenient to place the boiler higher than the working cylinder, a water cylinder is introduced, which is made to communicate with the boiler, and thus answer the same purpose as the elevated boiler.

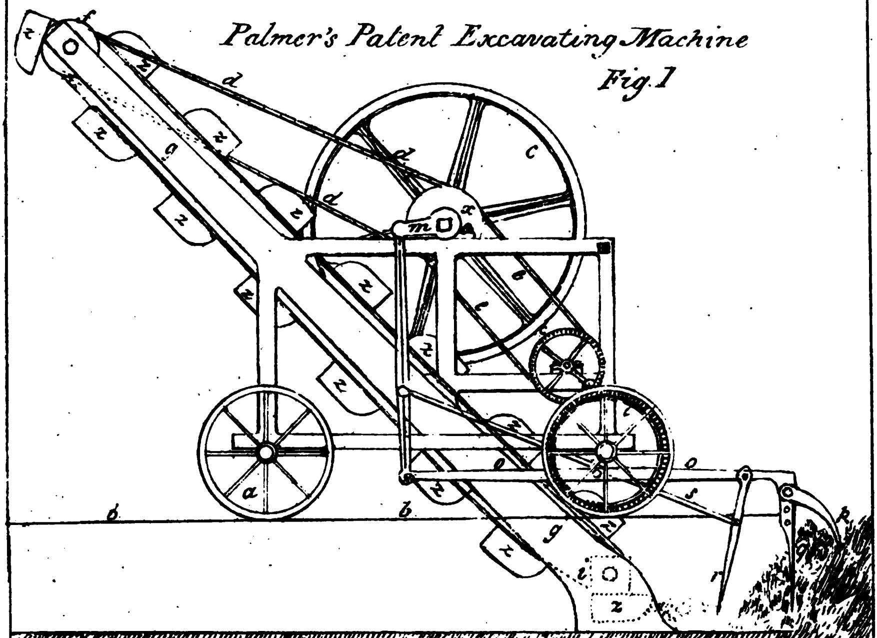
The contrivance is so ingenious that we cannot but regret to notice, what may, in some measure, be deemed a defect; but it will readily be perçeived, that an increase of friction will result from the enlargement of the friction rod.

The arrangement of the different parts of this engine will be at once comprehended by inspecting the accompanying engraving, where *a a* represents the working cylinder with its piston *b*, and a large piston rod *c*, passing through its stuffing *b g g*. *d* is the boiler with a communication *e e*, for the water to pass freely between it and the lower end of the cylinder. *f f* is a steam communication between the boiler and the upper end of the cylinder, represented broken off. In connection with this steam passage is a two way cock, of the usual construction, for permitting the steam to escape after it has forced the piston to the bottom of the cylinder. Sometimes the upper or steam end of the cylinder is surrounded by a portion of the flue, to continue or increase the elastic force of the steam; but when this plan is adopted, the cylinder must be protected from injury by a coating of fire-brick, or other non-conducting material.

Another modification of the apparatus is represented by fig. 2, Plate XV, where *b* shews the boiler; *c* a cylinder bolted thereto, communicating by the pipe *a* to the upper end of the working cylinder *d d*; *e* is the piston, which is extended by a solid plunger *f*, formed of a non-conducting substance, in order that the steam which acts on its under side may be farther removed from the water above the piston, and less liable to condensation, to prevent which effect also, the lower part of the working cylinder is surrounded by the flue of the furnace. The steam is brought on from the boiler by the pipe *g*, whence it enters a spherical chamber *h*, which is exposed to a high temperature, becoming therein surcharged with caloric, it is conducted in a highly elastic state by the pipe *i* into the valve box *k*, wherein it is conveyed by the pipe *l* to the lower end of the cylinder, and raises the piston and

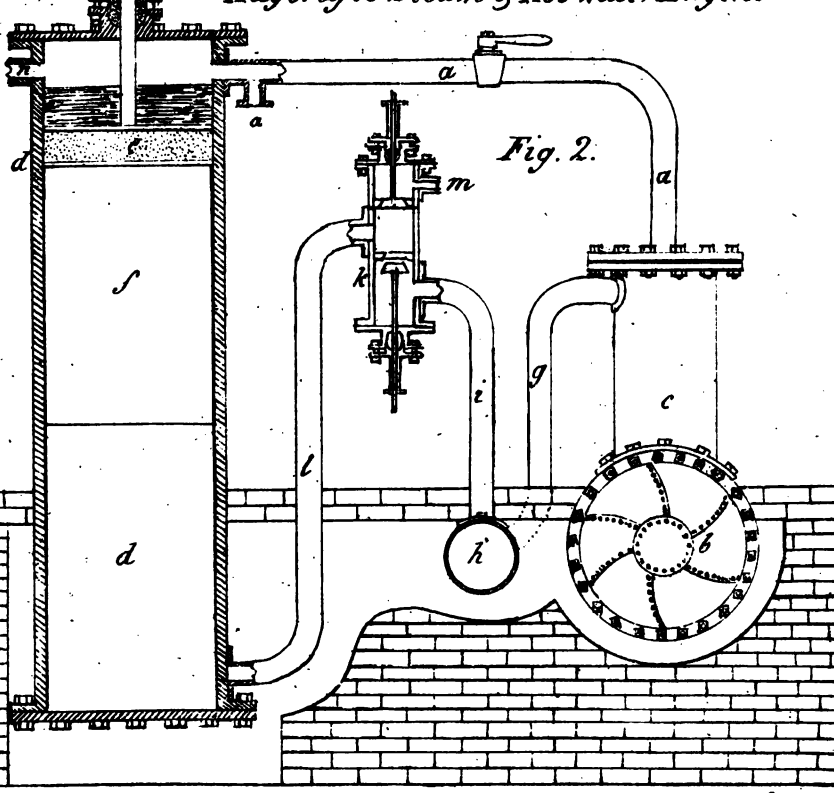
Palmer's Patent Excavating Machine

Fig. 1



Haycraft's Steam & Hot-water Engine

Fig. 2.



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plunger: the water above the piston being at the same time permitted to pass along the water tube *a* and return into the boiler. When the piston reaches the top of the cylinder the lower valve *k* is closed, and the upper one is opened, which permits the steam which occupied the lower part of the cylinder to escape by the pipe *m* into the atmosphere, or into a condenser, if one be employed. The pipes *n* and *o* are connected with force pumps, for regulating the supply of water to the apparatus.

From the drawings attached to the specification of this patent, it would appear, that considerable obstruction to the motion of the piston would arise from the smallness of the water passages, and power would necessarily be wasted in causing water to pass through pipes with great velocity. There will be but little difficulty, however, in adjusting the magnitude of the various parts of the apparatus to avoid all imperfections of this description.

CHIMNIES.—To Sith Smith, of Wilton Crescent, Knightsbridge, Middlesex, Builder, a patent for "certain improvements in chimnies, for dwelling and other houses and buildings," was granted on the 14th of September, and the specification was enrolled in the Petty Bag Office on the 14th of December, 1830.

This patentee proposes to constitute chimnies or rather flues of iron tubes, to be cast of appropriate lengths and diameters, according to the intended capacity of the flue. These are to be built into the wall, and constitute a circular opening lined with iron. Each piece of pipe is cast with one end somewhat enlarged, to receive the smaller end of the succeeding piece, and when the chimney flues are to be turned from the straight course kneed or bent pieces of pipe are introduced, to give any required curvature.

In addition to the introduction of cast-iron tubes, to constitute chimney flues, Mr. Smith claims the invention of a method regulating the size of the flue at the root of the chimney, by the application of a pair of hollow iron cones, attached at their passes, which must be made equal to the flue in diameter. A cross piece is attached to the apex of the upper cone, whose ends move in slots made for their reception in the lower piece of tubing. From each of the cross bars two chains pass over two pulleys fixed in the chimney, a small distance above the cones, where the two chains are connected, and passed down through an aperture coinciding with the axes of the cones, where it is furnished with a counterpoise. And by this the cones may be elevated so as to

close the chimney entirely, and to answer the purpose of a chimney board, when fires are not wanted; or they may be lowered to regulate the opening to any assignable size, according to the required draft, depending upon the quantity and kind of fuel employed.

There is nothing new in the first part of this patent, for a plan of making flues of iron pipes was proposed several years ago.

Mr. Smith's method of adjusting the size of the flue to the draft required appears to be new, and likely in many cases to prove useful.

Excavating Machine.—To George Vaughan Palmer, of the parish of St. Peters, Worcester, Artist, a patent for "a machine to cut and excavate earth," was granted on the 8th of June, and the specification was lodged in the Enrolment Office on the 8th of December, 1830.

The object contemplated by this patentee, is the construction of a machine, which by the application of steam power, or other first mover, loosens, dug up, and remove into a cart, earth from the cut of a canal or excavation, and at the same time moves itself forward as the excavation proceeds. The machine is similar in principle to the dredging machines employed in clearing the beds of rivers or harbours; but it has several appurtenances, such as picks for loosening the earth, cutters for separating it, and scrapers for filling it into the scoops or elevators, which convey it into the cart by which it is moved away.

This machine is exhibited by fig. 1, Pl. XV. where *a a* represent two of the four wheels on which the machine is mounted; *b* a temporary railway on which the wheels gradually move as the excavation proceeds. The moving power (which may be that of a steam engine or any other adequate force), is applied to the axis of a fly wheel *c*; on this axis there is fixed a drum or pulley *x*, round which are passed endless chains or bands *d* and *e*: the band *d* communicates the motion to another drum *f*, which revolves in bearings at the upper ends of the long cheeks or supports *g*, (one of which is only brought into view), and an endless chain *h h* carries the motion on to another drum *i* (of a rectangular figure), turning on an axes in the lower end of the frame cheeks *g*; to this chain *h h* are attached a series of earth scoops *z z z*, that are thereby successively brought into operation in taking up the earth.

So far the machine resembles the action of the common dredging or ballast engine; but it possesses several important and in-

genious additions, by which the several motions of picking, digging, and projecting the earth is uniformly effected. The chain *e* communicates motion from the drum *x* to the spur wheel *k*, which acts upon a toothed wheel *l*, attached to the fore carriage wheel *a*, by the motion of which, the apparatus is advanced by degrees as the excavation proceeds. The crank *m* fixed on the main axis, actuates through the medium of the connecting rod *n* and the lever *o*, the pickers *p* and the cutters *q*, as well as the scraper *r*, which is, at the time of its descent, pulled forward to fill the scoops *z*, by the sloping connecting rod *s*. The pickers, cutters, and scrapers, extend in rows the whole breadth of the machine. The pickers resemble and act as pick-axes; they are either made as represented, which the patentee denominates half-pickers, or they are made double, and caused to rotate by means of a chain and drum in connection with the first mover.

A machine of this description may answer for excavating earth which is in a state of uniform softness, but we doubt its applicability to cutting through the variety of earths generally met with in extensive excavations.

SUGAR.—To C. Derosme, of Leicester Square, a patent for "certain improvements in extracting sugar or syrups from cane-juice, and other substances containing sugar; and in refining sugar and syrup. Partly communicated by a foreigner," was granted on the 29th of September, and the specification was deposited in the Enrolment Office on the 29th of November, 1830.

Mr. Derosme proposes to extract the sugar from roots, &c. by maceration, washing, and evaporation; but he does not distinguish his improved plan from that usually adopted for the same purpose. He states, however, with more precision, his method of discolouring syrups. He takes a cylindrical vessel, and places within half an inch of the bottom, a perforated diaphrim, over which a cloth is placed, and this is covered with bituminous schestos or animal charcoal, or both, mixed and reduced to a powder similar to coarse gun-powder; which is to be introduced in layers, two or three inches thick, and pressed down with a moderate force, so that the whole mass may be of an uniform density. The charcoal is then covered over with a second piece of cloth, and a second perforated diaphrim. The charcoal, &c. finely powdered and mixed with sand, is stated to answer as well as the granulated charcoal. The syrup, which must be of the consistence of one

part water to two of sugar, being then poured on the top, is discoloured by perculating through this mass.

GLAZING.—To J. Harrison, of Wortley Hall, York, and R. G. Curtis, of the same place, Glaziers, a patent for "certain improvements in glazing horticultural and other buildings, and in sash bars and rafters," was granted on the 6th of October, and the specification was lodged in the Enrolment Office on the 6th of December, 1830.

This invention may be described in a few words, to consist of a plan for making sloping glass frames, for horticultural and other purposes, without cross rails, and without any projection of the middle of the longitudinal rails between the different rows of glass panes. The lower end of one pane is made to lap over the upper end of another, as in slating, and their edges are bedded in putty or other similar cement, and secured by screws passing into the frames where the corners of the panes meet, the corners being taken off for the passage of the screw. It is stated by the patentee, that as no water can lodge upon sloping frames of this description, they will last much longer.

His proposed improvement in sash bars and rafters, consists of an application to the sash bars of a kind of slight frame work, like an inverted rafter strongly united at the joints, and having the sash bar for a tie-beam.

ON THE ELASTIC FORCE OF VAPOUR AT HIGH TEMPERATURES.

A COMMITTEE, appointed by the Academy of Sciences, has been engaged in carrying on experiments to determine the elastic force of vapour at high pressures: the labours have principally devolved upon M. M. Dulong and Arago. The results have been obtained experimentally up to 25 atmospheres, and extended to 50 by calculations. That no error dependant upon the use of valves should interfere, it was resolved to estimate the force exerted by the columns of mercury sustained. A glass tube was therefore prepared by M. M. Thibaudeau and Bontemps, consisting of 13 pieces, 2 metres (78.74 inches) each in length, 5 millimetres (0.2 of inch) in diameter, and the same in thickness. Each piece was sustained by counterpoises, so that the lower should not be crushed by the upper, and the whole was erected in a square tower, which is the only remains of the antient church of St Genevieve.

Fearing that if the steam from a boiler were made to act di-

rectly upon such a column of mercury as this tube would sustain, it might, from intermission of its force, occasionally produce such sudden agitation in the metal as to endanger the safety of the whole, it was resolved to form a kind of manometer, in which the compression of a given volume of air should be ascertained, first, by the column of mercury, and afterwards used as a measurer of the elasticity of vapour at various temperatures. In this way the estimations would be as accurate as if made directly by the column of mercury. The preparation of this instrument gave an opportunity of examining the law of Mariotti, namely, that all gases are compressed in volume in proportion to the energy of the compressing force. Boyle and Muschenbroek thought they saw errors in this law, even when the force was not above 4 atmospheres. Robinson and Sulzer carried the force to 8 atmospheres, and agreed in giving the same departure from the law, namely, that when compressed eight times, instead of exerting a force eight times that of the common air, it was only six times greater. Oersted, on the contrary, found the law true to 8 atmospheres, and even up to 60 atmospheres; but his mode of experimenting is not satisfactory to the French commissioners, though the results were correct.

In the preparation of the manometer the experiments were carried to 27 atmospheres, and the law found to be *correct*. It was intended to ascertain if it held good with other gases than air, but the authorities forbade the use of the old church tower for this purpose.

There appears to have been much fear about steam at the pressure of 24 or 25 atmospheres; and, lest the boiler should explode, and blow up the old vaults, and even destroy neighbouring buildings, it was determined to have it in the court-yard of the observatory, and make the experiments there. Ultimately, therefore, the manometer was transferred though with great difficulty, and finally placed in proper communication with the boiler.

Some important precautions were now taken to ascertain the temperature accurately. The first was to take account of the cooling effect of the air on that part of the thermometer exterior to the boiler; this was done by retaining it constantly at the same temperature. The next was to prevent alteration in the capacity of the bulb, by allowing the vapour to press upon it. This was effected by putting the thermometers into gun-barrels, made thin, closed at one extremity, and filled with mercury; these, when fitted to the boiler, were made to descend, one to the bottom of the boiler nearly, to give the temperature of the water; the other to within a few inches of the water, to give the temperature of the vapour.

The temperature and pressure were then experimentally ascertained up to 24 atmospheres; after which formula was sought for, by which they could be extended to higher pressures, and the following one adopted:

$$e = (1 + 0.7153\ t)^5$$

e being the elasticity; *t* the excess of temperature above 100° C, taking for unity 100° of the centigrade thermometer. This formula nearly represents the results given by experiment up to 24 atmospheres; the greatest error has been at 8 atmospheres, and was then 0.9 of a degree. It was more accurate for the higher pressures, being calculated from them, and the commissioners have no doubt that at 50 atmospheres the error is not more than 0.1 of a degree.

Elasticity of the Vapour taking the Pressure of the Atmosphere as Unity.	Temperature.	
	Centigrade.	Fahrenheit.
1	100.	212.
1½	112.2	233.96
2	121.4	250.52
2½	128.8	263.84
3	135.1	275.18
3½	140.6	285.08
4	145.4	293.72
4½	149.6	301.28
5	153.8	308.84
5½	156.8	314.24
6	160.2	320.36
6½	163.48	326.26
7	166.5	331.70
7½	169.37	336.86
8	172.2	341.96
9	177.1	350.78
10	181.6	358.88
11	186.3	367.34
12	190.0	374.00
13	193.7	380.66
14	197.19	386.94
15	200.48	392.86
16	203.60	398.48
17	206.57	403.82
18	209.4	408.92
19	212.2	413.96
20	214.7	418.45
21	217.2	422.96
22	219.6	427.28
23	221.9	431.42
24	224.2	435.56
25	226.3	439.34
30	236.2	457.16
35	244.85	472.73
40	252.55	486.59
45	259.52	491.14
50	265.89	510.60

The members of the committee remark, that they could find only only one English table of the force of high pressure vapour; it had been given to M. Clement by Mr. Perkins, but it was found sadly erroneous: for instance, at the temperature of 215° C, or 419° F., the force in it is given as 35 atmospheres, whereas it is really only 20, or little more than one half. In Germany a table has been constructed by M. Arzberger, of Vienna, which rises to 20 atmospheres, and is much nearer the truth than Mr. Perkins. It is about 3 atmospheres wrong at the highest pressure.—*Bib. Univ.* xlii. p. 338.—*Bull. Univ.* A. xii. 407.

EXPERIMENTS ON THE FRICTION AND ABRASION OF THE SURFACES OF SOLIDS.

By George Rennie, Esq., F. R. S.

[Abbreviated from the Transactions of the Royal Society.]

(Continued from page 212.)

The apparatus employed in performing the experiments on the friction of attrition, consisted simply of a strong table, accurately made and adjusted, and provided with a platform capable of being elevated to any angle within 20 degrees, as shown by a graduated arc, fixed to one end of the table. The substances tried were placed on the platform, and under a sliding block above, and to the latter was suspended a scale and weights, for bringing the substances into closer contact. The substances thus pressed upon, were then drawn over the platform, by attaching to one end of the sliding block a cord, which passing over a pulley was attached to another scale, (underneath the pulley;) into this the necessary weight being put, motion was given to the weighted sliding block, having the substance experimented upon underneath it over the platform. The different phenomena were then accurately recorded in a series of tables, which our limits will not permit us to insert here, (see Trans. Roy. Soc.); but the following were the principal deductions made therefrom.

First.—By experiments made on the friction of 3 *square inches surface with cloth it was shown,* that with fibrous substances, such as cloth, friction diminishes with an increase of weight.

Second.—That friction is greater (cæteris paribus) with fine cloths than with coarse cloths.

Third.—That friction is greatly increased by time.

Fourth.—That friction varies from one-third to an amount greater than the total weight.

By experiments made on the velocities with drab-milled kerseymere cloth, No. 3, it was shown

First, that velocities observe no particular law.

Second, that increase of surface very much increases the resistance.

By experiments made on the friction of cloth at different angles of elevation, it was shown that

The less the weight, the greater the angles of repose.

Increase of surface produces a very great increase in the angles of repose.

The times very variable, diminish with increase of weight.

Upon experiments made on the friction of different woods upon two square inches of surface variously loaded; on a horizontal plane and at different angles of inclination, it was remarked that,

Increase of pressure scarcely increases the resistance. This may arise in some degree from the surfaces becoming condensed, and thus rendered less liable to abrasion. In some of the cases abrasion had already commenced, but it was not convenient to pursue the experiments further.

The soft woods present more resistance than the hard woods;—yellow deal on yellow deal being the greatest; red teak on red teak the least.

According to Mr. Knowles, of the Navy Office, the weight of the Prince Regent, of 120 guns, on the slips previous to launching, was 2400 tons; which divided by the area of the sliding surface of her bilge-ways, (equal to 149,184 square inches) gives a pressure of 36 lbs. per square inch.

But the weight of the Salisbury, of 58 guns, on the slips, according to the area of her bilge-ways, was 44 lbs. per square inch. Now by Mr. Rennie's tables, the average force required to put in motion the three different kinds of oak, under a pressure of 56 lbs. per inch, is about one eighth of the pressure, which proportion prevails as high as 6 cwt. per inch area; and we find, that soft soap, the ingredient mostly used for diminishing the friction of bilge-ways, under a pressure of 56 lbs. per square inch) gives about 1-26th of the pressure for the friction. Hence the angle at which a building slip should be laid can be easily determined. Coulomb even makes 49 lbs. per square inch, and 1-27th for the pressure for hogs lard.

The weight of the middle arch (of 151 feet 9 inches span) of the New London Bridge, together with the centres 4900 tons. This acting upon the surface of the striking wedges, equal to 540 square feet, gives a pressure of 140 lbs. per square inch. The angles of inclination of the wedges are equal to 80° 45′, and their surfaces are covered with sheets of copper well coated with tallow. On removing the cheek pieces, the wedges commenced gliding back slowly and uniformly, by the gravity of the arch and centres, and the motion was checked and continued until the arch was left in equlibrio.

In making the experiments on metals, the apparatus consisted of a roller working in a block, and having a cord wound round its surface, so as to allow of a descent of the moveable weight of 21 feet: to the axles of the roller were suspended by slings a scale, containing the fixed weight.

The table of experiments on *extent of surface with metals,* gave the following results:—

	Varies from
Cast-iron upon cast-iron, laid flat........	6·58 to 7·53
Do. edgewise......	6·2 to 6.5
Hard brass upon cast-iron, laid flat......	7·2 to 7·8
Do. edgewise......	6·0 to 8·0

	Varies from
Yellow brass upon cast-iron, laid flat	6·09 to 7·22
Do. edgewise....	6·1 to 7·24
Tin upon cast-iron, laid flat	5·4 to 6·11
Do. edgewise	5·09 to 6·11

That the friction is nearly the same with cast-iron and brass, whether the load be applied on the broad sides or on the narrow sides of the plates, although the areas of the surfaces are to each other as 6·22 : 1.

That tin being a softer metal, and more easily abraded, the friction increases when a load is applied above 8 lbs. per square inch, but remains nearly the same with the broad side as the narrow side. Generally speaking, the friction is less with the broad side than the narrow side.

After the foregoing remarks Mr. Rennie proceeds to give two extensive tables.

On the friction of different metals, with the weights increased from 14 lbs. to 192 lbs., and on the power required to move a weight progressively increased until the metals abrade each other, to which he adds a tabular appendix, which we here subjoin.

Table shewing the comparative amount of friction of different metals under an average pressure of from 54·25 lbs. to 69·56 lbs.; as calculated from the foregoing experiments.

Description of Metals.	Average Weight.	Proportion.	Weight per sq. in. area lbs.	oz.
Brass upon wrought-iron	69·55	7·312	11	12·4
Steel upon steel	69·55	6·860	11	12·4
Brass upon cast-iron	54·25	6·745	8	0·5
Brass upon steel	69·55	6·592	11	12·5
Hard brass upon cast-iron..........	54·25	6·581	6	15·9
Wrought-iron on wrought-iron......	69·55	6·561	11	12·5
Cast-iron upon cast-iron	54·25	6·475	8	0·5
Cast-iron upon steel	69·55	6·393	11	12·5
Cast-iron upon wrought-iron	69·55	6·023	11	12·5
Tin upon wrought-iron	69·55	5.846	11	12.5
Brass upon Brass	69·55	5·764	11	12·5
Tin upon cast-iron................	54·25	5·671	8	0·5
Steel upon wrought-iron	69·55	5·198	11	12·4
Tin upon tin	69·55	3·305	11	12·5

From the various experiments it appears ;—

First.—That the friction of metals varies with their hardness.

Second.—That the hard metals have less friction than the soft ones.

Third...That without unguents, and within the limits of 32 lbs. 8 oz. per square inch, the friction of hard metals against hard metals may very generally be estimated at about one-sixth of the pressure.

Fourth.—That within the limits of their abrasion the friction of metals is nearly alike.

Fifth.—That from 1·66 cwt. per square inch to upwards of 6 cwt. per square inch, the resistance increases in a very considerable ratio, being the greatest with steel on cast-iron, and the least with brass on wrought-iron, their limits being 30, 36, 38, and 44 cwt. An experiment was made with 10 toes per inch on hardened steel, which abraded.

The remarkable property of steel in hardening, and its power to resist abrasion, render it preferable to every other substance yet discovered in reducing the friction of delicate instruments, as is exemplified in the different experiments on the pendulum, and the assay and other balances recently introduced at the Royal Mint and the Bank of England.

Mr. Rennie next proceeds to give a series of experiments in a tabular form, *on the friction of axles, with and without unguents.*

From the experiments without unguents it appears,

That when gun metal without unguents is loaded with variable weights of from 1 to 10 cwt. friction varies nearly in the proportion of $\frac{1}{7\cdot83}$ to $\frac{1}{4\cdot70}$ of the pressure.

That length of time scarcely affects it.

That friction increased when yellow brass was tried.

That friction decreased when cast iron was tried.

That friction decreased still more when black lead was used between the three different metals.

Remarks on the Experiments with Unguents.

That gun metal on cast iron, with oil intervening and a weight of 10 cwt. amounted to $\frac{1}{3\cdot63}$ of the pressure.

That when the insistent weights were diminished, the friction with oil was reduced to $\frac{1}{37\cdot33}$, but increased with an increase of weight.

That cast iron on cast iron, under similar curcumstances, showed less friction.

That the friction of cast iron on cast iron was still further diminished by hogs-lard.

That the friction of yellow brass on cast iron was increased by light weights and diminished by heavy weights, perhaps from being less fluid and sensible in the one case, and more capable of preventing the contact of metals in the other.

That gun metal on cast iron with hogs-lard gave less friction than with oil.

That yellow brass on cast iron with anti-attrition composition of black lead and hogs-lard, increased friction with light weights, and greatly diminished it with heavy weights, showing extremely irregular results.

That yellow brass on cast iron with tallow gave the least friction, and may, therefore, be considered the best substance under the circumstances tried.

That yellow brass on cast iron with soft soap gave the second best result, being superior to oil.

That yellow brass on cast iron with soft soap and black lead gave the worst result, diminishing the friction in the inverse ratio of the weight.

Conclusion.—That the diminution of friction by unguents, varies as the insistent weights and natures of the unguents; the lighter the weight the finer and more fluid should be the unguents, and vice versa.

Mr. Rennie's experiments "on the velocities in friction," showed, that friction did not increase with an increase of velocity. The time in falling the whole height of 21 feet being double the time in falling half the height.

Mr. Rennie also describes some experiments on the friction of ice, from which it appears that with ice on ice, friction diminishes with an increase of weight, but does not seem to observe any regular law with regard to that increase.

Experiments in the Friction of Hide Leather.

Twelve pieces of hide leather were placed parallel to each other in a wooden box, with one side loose so as to admit of being adjusted according to the number of pieces of leather; a bolt was then passed through the whole, and a nut screwed on the end of the bolt so as to compress the pieces of leather together and permit them to act on edge as one uniform surface; which surface was increased or diminished by putting in or taking out some of the pieces of leather and screwing up the nut as before.

Friction of 9 square inches of Leather soaked in water, moving over a plate of Iron.

7lbs. barely kept in motion 36lbs. after starting with the hand. After remaining 5 minutes it took 29lbs. to start it. 28lbs. barely kept in motion 64lbs. after starting it, and after remaining one minute it took 42lbs. to start it.

Surface 1½ by 3 inches, equal to 4½ inches area.

6½ lbs. barely kept in motion 36 lbs. after starting it. After remaining 5 minutes it took 21 lbs. to start it. 21 lbs. barely kept in motion 64 lbs. after starting it. After remaining 5 minutes it took 38 lbs. to start it.

The friction of hide leather soaked in water appears to be greatly increased by time and weight. This circumstance explains the enormous friction evinced in the pistons of pumps when first put in motion. When the leather is not soaked, the resistance varies from

one ⅓th to nearly one 1-6th of the pressure, and is diminished (cæteris paribus) by a diminution of surface.

On the Friction of Stones.

Rondelet found that stones well dressed, required angles of from 28° to 36° before they commenced gliding.* Perronet observed them to vary from 39° to 40°.† The granite voussoirs of the arches of the New London Bridge having their beds well faced and dressed without mortar, generally commence gliding at angles of from 33 to 34°. But with a bed of fresh and finely ground mortar interposed, the pressure on the centering commences at angles of from 25° to 26°. In other cases of arches where sand stones, such as Bramley Fall and Whitby, were employed, and their beds faced and dressed as usual, the angle of gliding was found to vary from 35° to 36°. But with mortar interposed, the angle generally varied from 33° to 34°.

It results from these and other experiments, that friction, by absorbing part of the horizontal thrust, is a most powerful assistant in maintaining the equilibrium of arches, and enables us to determine with something like precision the allowances due to theory.

In general, stones which have a fine grain and uniform texture, and are sonorous and heavy, resist abrasion in proportion to their hardness; and in some experiments of Morisot,‡ granite resists abrasion twelve times more than lias, whilst the former only possesses a repulsive power three times greater than the latter.

The experiments of Boistard give 0.78 for the friction of hard calcareous stones.§

On the Friction of Machines.

1. 21 cwt. suspended at each extremity of a chain (passing over two cast iron sheaves of 2 feet diameter with wrought iron axles, working in brass bearings oiled, and 12 feet 10 inches apart) was disturbed by 3 cwt. or 1-14th of the total weight. Another double purchased crane indicated 1-9th.

2. A double purchased crane having a weight of 7057 lbs. suspended to it indicated 7.62 for the friction. Another double purchased crane indicated 1-9th.

In an experiment made on one of the corn mills recently erected for His Majesty's victualling department at Deptford, it required 1-10th of the weight of the mass to overcome the inertia and friction of the bearings and tangential surfaces. In this instance the pressures of the different parts of the machine varied from 28 lbs. to 8 cwt. per inch area, and the velocities of the surfaces from 50 feet to 120 feet per minute.

* L'Art de Batir. Tome iii.

† Mémoire sur le Cintrement et Décintrement des Ponts.

‡ Morisot. Tome iv.

§ Recueil d'Experience et d'Observations. &c.

Remarks.

It has been customary to deduct one fourth of the power expended for friction. This allowance may obtain in machines newly set in motion. When the bearings have been equalized and the rubbing surfaces extended by the abrasion of the irregularities, the friction will be diminished and the movements of the machine be more steady. But when the bearings are properly proportioned to the weight of the parts of the machine, and their surfaces kept from contact by unguents, a much less allowance may be made.

TABLE—*Showing the amount of Friction (without unguents) of different Substances, the insistent Weight being 36lbs. and within the limits of the Abrasion of the softest substance.*

	Parts of the whole weight.
Steel on ice	69.81
Ice on ice	36.00
Hard wood on hard wood	7.73
Brass on wrought iron	7.38
Brass on cast iron	7.11
Brass on steel	7.20
Soft steel on soft steel	6.85
Cast iron on steel	6.62
Wrought iron on wrought iron	6.26
Cast iron on cast iron	6.12
Hard brass on cast iron	6.00
Cast iron on wrought iron	5.87
Brass on brass	5.70
Tin on cast iron	5.59
Tin on wrought iron	5.53
Soft steel on wrought iron	5.28
Leather on iron	4.00
Tin on tin	3.78
Granite on granite	3.30
Yellow deal on yellow deal	2.88
Sand stone on sand stone	2.75
Woollen cloth on woollen cloth	2.30

These results are collected from the different Tables, but the comparison may be made by selecting other values within the limits of abrasion for a minimum.

General Conclusions.

From what has been stated hitherto, it is obvious,—

1st. That the laws which govern the retardation of bodies gliding over each other are as the nature of those bodies.

2nd. That with fibrous substances, such as cloth, &c. friction is increased by surface and time, and diminished by pressure and velocity.

3d. That with harder substances, such as woods, metals, and

stones, and within the limits of abrasion, the amount of friction is as the pressure directly, without regard to surface, time, or velocity.

4th. That with dissimilar substances gliding against each other, the measure of friction will be determined by the limit of abrasion of the softer substance.

5th. That friction is greatest with soft, and least with hard substances.

6th. That the diminution of friction by unguents is as the nature of the unguents, without reference to the substances moving over them.

The very soft woods, stones, and metals approximate to the laws which govern the fibrous substances.

In comparing the present experiments with those of Coulomb, the discordances found to exist relate principally to time. The limited pressures varying from 1 to 45 lbs. per square inch, under which his experiments were made, account in some degree for the anomaly. But in many of the minor, and in the general results, they will be found to coincide.

ACCOUNT OF AMERICAN PATENTS WHICH ISSUED IN 1830, WITH REMARKS AND EXEMPLIFICATIONS, BY DR. JONES.

[Extracted from the Journal of the Franklin Institute.]

For an Improvement in the manufacturing of Bench Plane Irons. WILLIAM HOVEY, *Boston, Massachusetts, March* 10.

STEEL is to be welded on to a bar of iron, extending its whole length; this bar is then to be rolled down to the thickness of the thick part of a plane iron; it is then to be cut into proper lengths and passed through eccentric rollers, so formed as to give to the iron its proper taper, after which the finishing is effected in the usual way. The claim is to the giving of the taper by eccentric rollers.

For Machinery for cutting the screws of Gimblets. CHARLES DANIELS, *Assignee of William W. Southworth, Saybrook, Middlesex County, Connecticut, March* 30.

A BURR, buzz, or cutter, of cast steel, grooved on its cutting edge so as to form two cutters, is made by proper means to revolve on an arbor. The gimblet to be cut is held on the end of another arbor, which has vice jaws for that purpose; the axis of this is somewhat inclined to that which carries the cutters. The back end of this arbor has a male screw formed on it, and passes through a collar with a female screw, so that when the arbor is turned by means of a crank, the point of the gimblet advances against the cutters which form the double screw at one operation. The claim is to the cutting

the double screw at once; a similar machine, with a single screw, having been heretofore in use.

For an Improvement in the Machine for thrashing Grain. James Cooper, *Augusta County, Virginia, April* 10.

Most of the usual appurtenances of a thrashing machine are found in this, but instead of the hollow segment generally employed, there is an "elastic thrashing cover, or floor," which is formed of slats of wood, placed side by side, and covering the whole length of the cylinder over the beaters; upon these elastic slats springs are made to bear, and between them and the beaters the grain to be thrashed is conducted by the feeding rollers. The claim is to the elastic cover, or floor.

For an Improvement in the Steam Boiler, Henry M. Shreve, *Louisville, Kentuckey, April* 21.

This boiler is a cylinder placed vertically, and it is proposed to make it 25 feet long, and forty-fivei nches in diameter. This we are informed is the size of two which have been constructed and used. A proper furnace is fixed under the boiler, and sixteen flues, each seven inches in diameter, pass through the lower head, and up through the water, to the height of twenty feet; they then pass out through the side of the boiler into a heated air chamber, formed by an iron casing which surrounds the cylinder; the heated air is made to descend between the outside of the boiler, and this iron casing, which is lined with fire clay; the depth of the casing is seven feet six inches; two chimnies rise from its lower edge, and conduct off the smoke to a convenient height. The steam pipe, safety valve, and gauge cocks, are placed in the upper end of the boiler, above the termination of the flues.

The patentee says, that two such boilers were placed on board the steam boat La Fouche; that the saving in fuel was one-half, and the room occupied on deck not one-fourth of that usually required. "The risk of the loss of lives, and the destruction of a boat, from explosion, is believed to be entirely removed; the upper head of the boiler being the weakest, must give way first, and in case of explosion, the contents will be thrown perpendicularly into the air, where it will be too much cooled before its descent to do any injury, even when passengers are not protected by an upper deck."

The claim is to the passing the flues through the lower end of a boiler, with an immediate escape at any point below the upper end, or with a re-descent along its outer surface when standing in an upright position.

For a Machine for boring Holes in Rocks. Israel Overald, *Liberty, Smith County, Tennessee, April* 23.

A frame is made consisting of a sill, two uprights, and a cap

piece, so as to resemble a frame for a door or gate; an auger is fitted into a socket in an iron rod, called the driver, this is placed to stand vertically in the middle of the frame, the sill being perforated to allow the shank of the auger to pass through it, and the upper end of the driver being secured in its position by means of a screw and nut, which affix it to a wooden spring, running along under the cap piece of the frame, and extending its whole length; this spring is so attached at its ends to elastic sliding pieces, that it may be lowered by means of slots in the uprights, and follow the auger as it descends; pieces called supports, are attached to the frame to set and keep it upright.

The claim is to "the construction of the whole of the above described machine, except the auger, or bit."

For a Machine for glueing Veneers on Columns or Pillars, to be used in cabinet work. Benjamin Hinkley, *Fayette, Kennebeck County, Maine, April 27.*

The column which is to be veneered is to be fixed in a frame, where it is held by screws, but so loosely that it may be turned round by a cross bar or crank, affixed to one of its ends. A waxed cloth, somewhat longer and wider than the veneer to be laid, is held in a vertical position, its lower edge being glued into a groove made along the column, and its upper edge fastened to a strip of wood. It is strained tight by a rope passing from this strip over a pulley, and acted on by a lever and weight. The veneer is placed against this cloth, its edge resting on the column, glue is then applied, and the column turned, the glueing being continued until the whole is wrapped round. The cloth is so managed as to strain tightly, and close the veneer to the column; it is then left until the glue is sufficiently hardened to take it from the machine, when the cloth is cut off, leaving a strip of it in the groove.

The description of this machine is elaborate, but not clear, the drawing which accompanies it is sufficiently well executed, but is without written references.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a Patent for an Improvement in the construction of Clocks. Granted to James Bogardus, *New York, March 2, 1830.*

To construct this clock he makes a wheel, which he calls the first wheel, to carry the hour hand, revolving twice in a natural day; and he gears with this a pinion which shall throw another wheel, which he calls his second wheel, twenty-four times round while the first

revolves once, being twice as fast as the minute hand should revolve, running of course in the contrary way from the hour hand wheel.

Then he gears a pinion of twice the number of teeth with the pinion on the axis of the second wheel, which pinion of twice the number of teeth as aforesaid, running the right way, will give the minute hand fixed to its axis the proper number of turns, or seven hundred and twenty, to the single revolution of the hour hand wheel as aforesaid. The said second wheel being geared by the pinion aforesaid to the hour hand wheel, and revolving twenty-four times, as aforesaid by means of the pinion, must be made of such diameter and number of teeth, and be so geared with the scapement wheel, which said Bogardus calls his third wheel, by means of a pinion on the axis of said scapement wheel, as to throw round the said scapement, or third wheel, thirty times at each turn of the said second wheel, and thus all the hands fixed to the said three axes respectively, will revolve together the required number of times. For convenience the axis of the wheels and pinions are placed vertically above each other, the hour hand lowest, and the second hand highest. The wheel that carries the hour hand has a tube fixed in its centre, through which the axis of the barrel is made to operate. The barrel secured to its axis, is connected with the hour hand, or first wheel, by a click on this wheel, which takes into a ratchet wheel fixed to a barrel. The axis of the barrel must be made with a square on its outer end, outside of, or within, the tube of the hour hand wheel, or first wheel, on which square, by means of a suitable key, the clock is wound up.

The principle of this improvement or invention, consists in this, that the wheel which carries the hour hand, as aforesaid, and the barrel for the chain or cord, or main spring, turn on a common centre, and are combined with the two other wheels and three pinions, constructed with such relative proportions as aforesaid, that the three hands marking the hours, minutes and seconds, shall be carried on three several axes as aforesaid, by a weight or spring applied to the barrel, and a pendulum or balance applied to the scapement wheel in any common form, so that the hands shall mark with precision their respective portions of time.

Clocks have been made with three wheels before, and of these a description is in Rees's Cyclopedia; but no clock has ever been made with three wheels to carry the three hands, or the hour and minute hands only, so that the said Bogardus contemplates the application of his principle for the construction and application of the aforesaid combination, to effect the motion of the hour and minute hand, as well without as with the second hand.

The said Bogardus further specifying the principle of his invention, observes, that he does not include, as an essential part of his invention, any particular forms or positions of the parts, nor any particular mode of construction in common use of known parts of horological machinery, these being susceptible of great variety without difference in principle, but he claims the application of the principle of his combination to all machines for marking portions of

time, whether of the larger kind, as clocks, or of the smaller kind, as watches, or of those called chronometers.

JAMES BOGARDUS.

Specification of a Patent for an Improvement in the Frame Bridge. Granted to GEORGE W. LONG, *of the United States Army, Fort Jackson, Louisiana, March* 10, 1830.

THE object of the invention is to acquire great strength in a bridge by means of a frame work, which may be analogous to a given solid beam of such a shape as to support the greatest possible weight, when in a horizontal position: assuming that figure which will make it equally strong throughout. For such a beam of uniform width that which is semi-eliptical in its longitudinal direction possesses this property: and the invention here claimed consists in arranging a frame work to possess this property of the solid beam; or rather to acquire great depth, and consequently strength of beam, by having the frame so supported by posts and braces as to be firm and unyielding to a weight placed on it; by which can be obtained such strength as will answer for bridges of two or three hundred feet span.

The bridges now in use involving in any degree the principles of this invention are of different kinds; the most common are a combination of the arch and frame constituting a crooked beam; and a late invention by Lt. Col. S. H. Long, of the United States Engineers, which is a straight beam; the ends and centres being the same in depth. All of the bridges here referred to, differ entirely in the arrangement of the timbers and shape, from the invention here claimed and set forth.

The improvement in question consists in the reduction of a framed beam to the most simple and mathematical form, and such that it will contain no superfluous weight of material, and that each timber of the frame shall receive a portion of stress to support any weight placed on the bridge; and further, that this stress shall be in the longitudinal or strongest direction of them, either in thrust or tension.

The form of the framed beam may be an elipse, a segment of a circle, or a triangle. The former is here assumed to explain the principles and mode of construction, which are as follows, and which are to be the same in each of the cases.

The framed beam consists, 1st, of a string piece made of one timber, or if more, they are to be joined with straps of iron so well bolted through the timber as to make the joints as strong as the other parts of the string, The string extends the whole length of the span.

2nd. A set of posts, at convenient distances apart, are made to rest on the string, and made fast to it by straps of iron passing under it and well bolted to the bottoms of them. They are to be notched at the bottoms on each side, transversewise of the bridge, to receive

sills on which the sleepers and flooring are to rest. The tops of the posts are to be furnished with small mortises on either side, the same as the cuts for the sleepers, to receive timbers which are to be supported between them. They are also to be notched under these mortises, on the outer sides from the centre, to receive the tops of the braces which are to stiffen and resist the crush of the bridge.

3d. A set of timbers joining the tops of the posts which are held in their places by small tenons and mortises. In the beam, they are to represent the upper edge or last point of fracture in a section.

4th. The braces are a set of timbers placed diagonally between the posts, all inclining inwards. The foot of each brace rests on the string near the bottom of each post, except the centre, and the brace then inclines to the top of the next inner post. It is to be cut with square notches at either end so as to receive any pressure it will bear, and not weaken, too much, the head of the post and the string piece. By these braces any weight placed on the bridge, which comes upon the posts, is distributed throughout the frame. A single-way bridge will require two of these beams, and a double-way, three. The sills, as before stated, are to rest on shoulder notches cut in the posts. They may also be so notched as to allow the two, to each set of posts, to come together and be trenailed, or clamped, tight to the posts. They are also to project over the sides of the bridge far enough to receive braces to stay the posts in their upright position. The posts must also be joined across the bridge at their tops by small timbers, which, with the last named braces, will render the bridge sufficiently stable. The sleepers and planking are to to be laid as in ordinary flooring. The bridge should also be furnished with side railings, which may be made as fancy may require.

The material for construction may be wood, or iron, or a combination of the two. The strings may be of iron, and also ties, in opposite diagonals to the braces of iron, may be substituted for the braces. If a chain is used for the strings, an inverted position of the bridge may be assumed, in which the chain becomes the part corresponding with upper timbers in the other case, and a similar reversed position will also take place in the other timbers.

It will be seen that a weight placed on a bridge of this description causes a stress throughout all of its timbers in their strongest directions; thus making it a strong and economical mode of construction. It possesses the great advantage of containing no more material than is directly applied to give strength; as well as its being the most plain work of carpentry. The saving in expense of piers and abutments, not required to resist a thrust, must also be counted a material advantage, especially on soft and mealy soil.

A further benefit claimed in the framed beam, is its use for supporting the roofs of houses or public buildings; by which a room of one or two hundred feet can be roofed without other supports than the walls.

A model ten feet long, 18 inches high, of 1½ inch cypress timbers, supported fourteen men, whose weight amounted to 2140 lb.

George W. Long.

Fig. 3, Plate XVI, is a side view of the bridge.
Fig. 4 is a vertical section through the centre posts.
S, S, &c. are strings, figs. 3 and 4.
P, P, &c. are posts, figs. 3 and 4.
i, i, &c. straps of iron attaching the posts to the strings, figs 3 and 4.
B, B, &c. are the main braces, fig. 3.
T, T, &c. timbers bracing the heads of the posts apart, fig. 3.
L, the sill of the bridge, fig. 4.
s, s, &c. are the sleepers, figs. 3 and 4.
F, is the flooring.
A, a joint in the string secured by straps of iron well bolted to the timbers, fig. 3.
b, b, braces. *t* cross piece to steady the frame, fig. 4.

Specification of a patent for an improvement in the production of Artificial Light, in the burning of tallow or oil, and other fatty substances. Granted to Isaiah Jennings, *City of New York, May* 20, 1830.

To all whom it may concern, be it known, that I, Isaiah Jennings, of the City of New York, have invented certain improvements in the production of artificial light, both in the burning of tallow and oil, and other kinds of fatty substances, which improvements consist in part in the mode in which tallow or other suitable substances, may be formed into candles, and in part in the structure of the apparatus in which they, or other fatty substances are burned, and that the following is a full and exact description of the same:—

1st. When hard fat is to be burned I form it into a candle, which I usually make of about two inches in diameter, and from four to twelve inches in length; these are made by casting the fat into a mould; the wicks are made flat, and about one inch and a quarter wide. These I usually make of cotton cloth, folded so as to give to the wick the desired thickness: it is cast in the tallow in the usual way.

A suitable stand, to be used as a candlestick, is prepared to receive this candle; the upper part of this stand c, (see Pl. XVI. fig. 2) is made cylindrical, and about the same diameter and length as the candle; the length, however, may be varied considerably. A glass tube A, is prepared, which is open at both ends, usually about nine inches long, and of such diameter as will allow the candle to slide freely, though tightly, in it. When the candle is placed upon the stand or candlestick above described, the tube is slid over it until its upper edge is nearly on a level with the top of the candle. This glass tube is made capable of being passed down over the cylindrical part of the candlestick, as the candle burns away.

A strip of brass or other substance, which I call a wick hole (D), is passed over the wick (B) in order to prevent its burning below the edge of the glass tube, and also the cylinder. The wick holder is

of such a length as to allow its ends to reach across and rest upon the glass tube; it has a slot or mortice of sufficient length and width to pass over the wick. The ends of the wick holder may be notched so as to form checks to retain it in its place upon the tube; or two or more flat or round wicks may be placed near the outer edge of the cylinder, the wick holders being so formed as to correspond.

A candle of this description will burn a whole evening without requiring to be snuffed, and may be decreased in length about one and a half inches. The glass tube may be then slipped down, the wick cut to a suitable length above the wick holder, and the candle relighted.

Soft grease or oil may be burned in a tube of this description, by having hard tallow at the lower part, or by making it tight with some other substance; or cork, or other elastic substance, may be used for the same purpose, pouring the grease or oil in above it, and allowing the wick to hang loosely from the wick holder within it; as it burns down it may be replenished, or the tube slid down as before.

A candle of the above kind may be made of any desired length or diameter; it may, for example, be two feet in length, and the glass tube need not be more than four inches. The tube may also be made of earthenware, or of any bad conductor of heat: a good conductor would melt the tallow throughout the whole length.

A glass burner may be placed over the flame if desired.

What I claim as new in the foregoing, is the glass or other tube, that is a bad conductor, sliding over the candle, in the manner, and for the purpose described. ISAIAH JENNINGS.

LIVERPOOL AND MANCHESTER RAIL-WAY.

On Saturday last (Dec. 4) the Planet locomotive-engine (one of Mr. Stephenson's) took the first load of merchandize which has passed along the railway from Liverpool to Manchester. The train consisted of 18 waggons, containing 135 bags and bales of American cotton, 200 barrels of flour, 63 sacks of oatmeal, and 34 sacks of malt, weighing altogether 51 tons 11 cwt. 1 qr. To this must be added the weight of the waggons and oil cloth, viz. 23 tons 8 cwt. 3 qrs.; the tender, water and fuel, 4 tons, and of 15 persons upon the train, 1 ton; making a total weight of exactly *eighty tons*, exclusive of the engine, about 6 tons. The journey was performed in 2 hours and 54 minutes, including three stoppages of five minutes each (one only being necessary under ordinary circumstances) for oiling, watering, and taking in fuel; under the disadvantages also of an adverse wind, and a great additional friction in the wheels and axles, owing to their being entirely new. The train was assisted up the Rainhill inclined plane by other engines, at the rate of 9 miles an hour, and descended the Sutton incline at the rate of 16½ miles an hour. The average rate on the other parts of the road was 12½ miles an hour, the

greatest speed on the level being 15½, which was maintained for a mile or two at different periods of the journey. The road, we understand, will be opened for the general carrying business in the course of a few weeks, when a further supply of engines is expected; the above experiment having been made in the mean time, for the purpose of acertaining the powers of the present engines, and of removing some doubts which have been most unaccountably entertained, as to the practicability of transporting cotton and other bulky articles along the railway. Taking this performance as a fair criterion, which there is no reason to doubt, four engines of the same class as the Planet (with the assistance of one large engine, constructed for the purpose, up the inclined plane) would be capable of taking upon the railway all the cotton which passes between Liverpool and Manchester. We understand that the journey on Saturday would have been performed in less time, had not the engineer, when passing over Chat Moss, allowed the fire to burn too low, and afterwards, when he found the steam was falling off, thrown a large quantity of coke upon it, which greatly reduced the temperature, and caused the loss of a considerable time, before the proper speed could be regained. The consumption of coke was, we believe, about two-thirds of a pound per ton per mile.—*Manchester Guardian.*

The Distance accomplished within One Hour.—It has often been a subject of doubt whether the distance from Liverpool to Manchester could be travelled by a loco-motive engine in the space of one hour. This extraordinary feat was performed on Tuesday morning (Nov. 23) by the Planet, one of Mr. Stephenson's most approved engines—the time occupied being only 60 minutes, of which two minutes were taken up in oiling and examining the machinery about midway. There were no carriages attached to the engine; the only persons on the tender being the engineer, the fireman, and Mr. Williams, the principal clerk in the Liverpool Crown-treet Station.—*Manchester Mercury.*

LONDON MECHANICS' INSTITUTION.

On the evening of the 8th of December, the Theatre of the London Mechanics' Institution was crowded with members and visitors, to witness the delivery to the successful candidates, of the two prizes of £10 each, founded by Dr. Fellows, for the best essay on a mechanical subject, and the best machine, or improvement of a machine, produced by the members of the Institution.

Dr. Birkbeck, the President (who was accompanied by many distinguished public charaters) opened the business of the evening, in which he gave a history of the competition for the prizes since they had been offered, and the excellent effects they had produced.

The present successful candidate for the best essay was Mr. George Newcomb, a printer, now resident in Bristol, who, while working at his trade in London, had acquired so much mechanical knowledge by his diligent attention at that Institution, as enabled him to produce, amongst several scientific essays that had been sent in from candidates for the prize, one, the subject of which was of great practical utility in mechanics—the effect of the governor and fly-wheel in regulating motion.

The present successful candidate for the best machine, was Mr. John Anderson, who was a native of one of the most mountainous districts in Scotland, (the same that had produced the Ettrick Shepherd), and had been self-taught in algebra before he became a member of the Institution, and in geometry, from which he had since derived great practical advantages.

After a very eloquent address on the advantages of knowledge, the learned doctor presented the prizes to the successful candidates, accompanied with elegant and well merited compliments—he congratulated them in having *elevated themselves in society by becoming its benefactors*. Mr. Newcomb had imitated a predecessor in his art, Benjamin Franklin, who had acquired a mighty name amongst mankind. Mr. Anderson, though now a working millwright, had evinced a genius that pointed him out for a distinguished engineer, probably a Smeaton or a Watt;—neither of whom at his age possessed so much knowledge of algebra or of geometry, and neither of them had then given such decided proofs of genius.

While the President explained the principle of the improved machine, Mr. Anderson gave a practical illustration of its utility, by turning a convex and concave roller, which were completed with great expedition, and fitted each other with mathematical exactness, (We annex a description of this important improvement of the lathe).

IMPROVED SLIDE-REST FOR LATHES.

By Mr. John Anderson, of the London Mechanics' Institution,

(for which one of Dr. Fellowes's Prizes, for 1830, was awarded.)

In the improved slide-rest the object proposed, was to turn the surfaces of the bodies circular in the longitudinal direction: the curved surface in such direction being either convex or concave to the axis of rotation. And it was more especially intended to apply when the degree of curvature required was very small, or which is the same thing, when the radius of the required curve was very great, as by the present mode of turning the greatest practical difficulty is found in such cases. The improved rest is also found to be equally applicable to the turning of bodies in the form of lenses, whether convex or concave. And in each of these cases the facility of operation, and accuracy of performance, is equal to that of the common slide rest in turning straight or flat surfaces.

The principle of the improvement or circle-turning appendage depends upon two geometrical propositions: First, that all angles in the same segment of a circle are equal: and second, that a straight line of any length, being made to move always parallel to itself, with one end touching a circle, the other end will describe a circle equal in every respect to the first.

Now in the improved slide-rest (see Plate XVI, fig. 1.) the triangle D C F is made to slide against the fixed pins at D and F: whence the vertex C will describe a portion of a circle greater or less in diameter, according as the angle D C F is made more or less obtuse: and further, the centre of the circle thus described will be on the one side or the other of a straight line joining D F, according as the vertex C of the triangle is on the opposite side.

The sliding triangle D C F consists of three pieces: viz. of two sides, D C and C F, with a slit or opening in each for the pins D and F to slide in, and they are moveable round a centre at C, by which means they can be made to form any angle with each other. The third piece or base of the triangle is the connecting bar *a b*, by means of which the two sides are held fast in any required position.

The sliding plate E E is similar to that of a common slide-rest, and it is moved backward or forward by a screw and handle B, in the same manner. Upon this plate and at right angles to the direction in which it moves, a box S is made to slide: within this box there is another sliding piece L, carrying the tool or cutter *t*. The interior sliding piece L is made to move within the box by means of a screw turned by the handle A, and by this means the cutter *t* can be made to advance or recede, as in a common slide-rest. The sliding box S is connected with and moveable round the centre C at the vertex of the sliding triangle: and hence if the box S move in any direction, the vertex C of the triangle must move along with in the same direction.

Now supposing it were required to turn a body of the form P in the figure. Set the sides D C and C F to the proper angle; then screw the three nuts *a* C *b* tight, which will retain them in that position. By means of the screw and handle A, make the sliding piece and cutter *t* advance as near the body P as is necessary to turn it of the required diameter. Then by the screw and handle B move along the sliding plate E E, which plate will carry along with it the sliding piece carrying the cutter *t*, the sliding box S, and the sliding triangle D C F. But it will be readily perceived, that as the triangle D C F moves along, the vertex C will describe a portion of a circle; and as the end of the sliding box S is connected with the centre C, the box will move along always parallel to itself, with that end touching the circle described by the vertex of the triangle. But the box S and the sliding piece carrying the cutter, may be considered as forming only one piece, as they always retain the same relative position to each other; except when altered by turning the screw and handle

Anderson's Improved Slide-rest for Lathes.

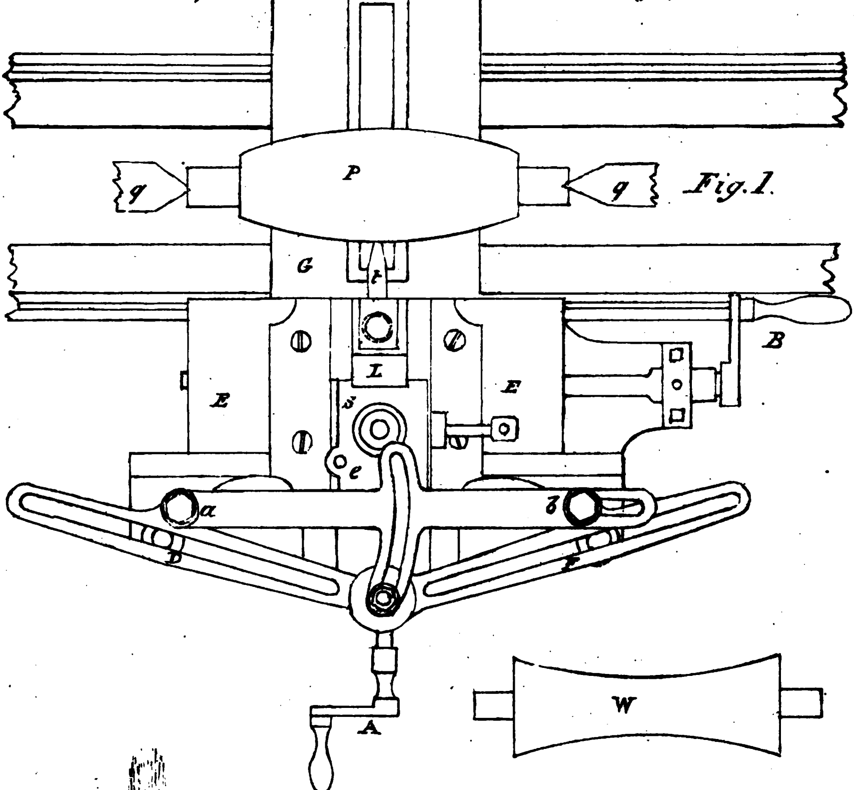


Fig. 1.

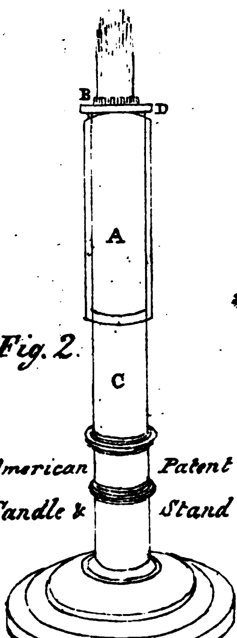
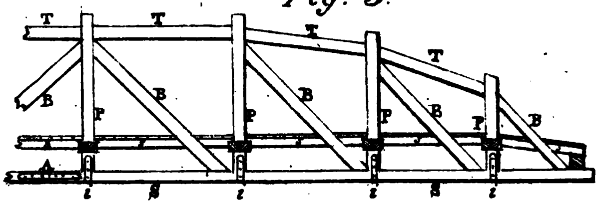


Fig. 2.

American Patent Candle & Stand

Fig. 3.



Long's Patent Bridge

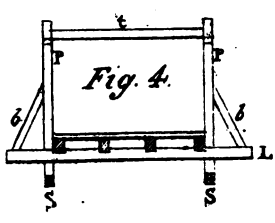


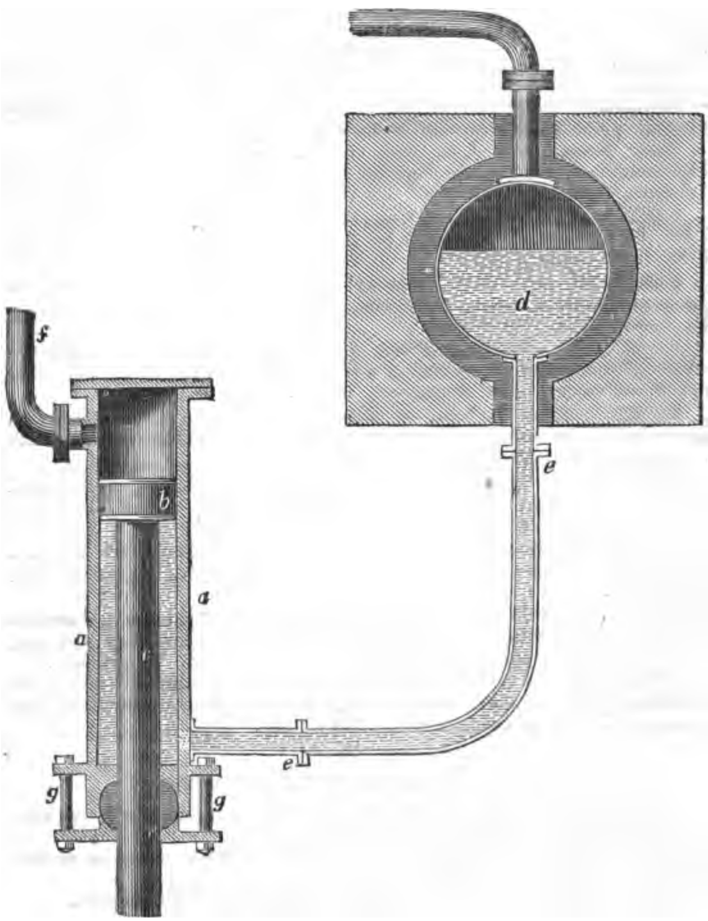
Fig. 4.

A. And hence the joint of the cutter *t* and centre C may be considered as the two ends of a straight line which always moves parallel to itself; and as the one end C always touches the circle described by the vertex of the sliding triangle, the other end *t* will (according to the geometrical proposition) describe the portion of a circle equal to it in every respect; and will thus by the revolution of the body P, turn it of the form required.

The separate figure in Pl. XVI. marked W, represents a concave roller, produced by shifting the vertex of the triangle or centre C, to the opposite side of the connecting bar *a b*.

DR. HAYCRAFT'S PATENT STEAM ENGINE.

[*Ought to have been inserted at page* 230.]



LIST OF NEW PATENTS SEALED.

ANTI-CORROSION.—To J. Revere, of Weybridge, Surrey, for an improved method of protecting iron chain cables, iron boilers, and iron tanks from the corrosion produced upon them by the action of water.—Dated 27th November, 1830.—Specification to be enrolled in two months.

PROPELLING.—To W. Church, Esq. of Haywood House, Warwick, for improvements in apparatus for propelling boats, &c. and also applicable for the purposes of evaporation.—29th November, 1830. Six months.

CALICO PRINTING.—To R. Dalglish, Jun. of Glasgow, for improvements in machinery for printing calicos and other fabrics.—6th December, 1830. Six months.

GRINDING SEEDS.—To H. Blundell, of the Town of Kingston-upon-Hull, for improvements in a machine for grinding or crushing seeds and other oleaginous substances, for the abstracting of oil therefrom, &c.—6th December, 1830. Six months.

SCOURING PAPER.—To R. Edwards, of Dewsbury, Yorkshire, for an improvement on or substitute for glass, sand, emery, and other scouring paper.—6th December, 1830. Six months.

MOORING SHIPS.—To S. Brown, of Billiter Square, London, for improvements in the means of drawing up ships and other vessels from the water on land, and for transporting or mooring ships, vessels, or other bodies on land from one place to another.—6th December, 1830. Six months.

FIRE ARMS.—To J. G. Lacy, of Camomile Street, and S. Davis, of East Smithfield, London, for improvements in the construction of guns and fire arms.—6th December, 1830. Six months.

COCKS.—To J. Dixon, of Wolverhampton, and J. Vardy of the same place, for improvements in cocks for drawing off liquids.—13th December, 1830. Two months.

COTTONS, &c.—To T. Walmsley, of Manchester, for improvements in the manufacture of cotton, linen, silk, and other fibrous substances.—13th December, 1830. Six months.

SPINNING.—To W. Needham, of Longour, Staffordshire, for improvements in machinery for spinning, doubling, and twisting silk, and other fibrous substances.—13th December, 1830. Six months.

LAMPS.—To S. Parlour, of Croydon, Surrey, for improvements on lamps, which he denominates "Parlour's improved Table Lamps."—13th December, 1830. Two months.

BATHS.—To J. L. Benham, of Wigmore Street, London, for improvements in shower and other baths.—Communicated by a foreigner.—13th December, 1830. Six months.

PROPELLING.—To R. Witty, of Basford, Staffordshire, for improvements for propelling carriages, vessels, &c. by steam.—13th December, 1830. Six months.

LOCKS AND TRIGGERS.—To B. Redfern, of Birmingham, Warwickshire, for a lock-break-off and trigger upon a new and improved principle, for fowling-pieces, muskets, &c.—17th December, 1830. Two months.

SPRINGS.—To A. Graham, of West Street, Finsbury, London, for improvements in the application of springs for carriages.—Communicated by a foreigner.—17th December, 1830. Six months.

TO OUR READERS AND CORRESPONDENTS.

Hypothetical Case.—Were the conduct of A. as stated by B. we have no hesitation in answering that it would be "*rude.*"

Zeta's letter could not be inserted without the extraction of matter, already in type, of *general* interest.

An Old Mechanic's favour is unavoidably deferred till our next.

PATENTS ENROLLED BETWEEN 10TH DECEMBER, 1830, AND 10TH JANUARY, 1831.

Particularizing the Offices in which the Specifications may be inspected, with the Dates of Enrolment.

SADDLES.—To Henry Calvert, of the city of Lincoln, Gentleman, a patent for "an improvement in the mode of making saddles so as to avoid the danger and inconvenience occasioned by their slipping forward," was granted on the 26th of October, 1830, and the specification was lodged in the Enrolment Office, on the 18th of December, 1830.

The manner in which Mr. Calvert proposes to effect the desirable object pointed out in the above title, will be clearly understood by inspecting the representation of one of his improved saddles in Pl. XVII. fig. 1, where *a a* represents a saddle, with the exterior flap removed, to show the improvement; which consists in attaching to the fore part of the saddle an elastic plate of metal *b*, extending in a sloping direction towards the front of the saddle, where it is furnished with a buckle at *d*, for the attachment of the girth *c*.

By the elasticity of the metallic plate it is kept close to its place, and by the attachment of the girth being as represented, the saddle cannot move forward with the girth being lengthened: a circumstance which will necessarily preserve it in its place.

HOOKS, SELF RELIEVING.—To Jeffrey Shores, of Blackwall, in the county of Middlesex, Boat Builder and Shipsmith, a patent for "an improvement or improvements on tackle and other hooks, which he denominates 'the self-relieving hooks,'" was granted on the 1st of November, 1830, and the specification was enrolled in the Enrolment Office, on the 1st of January, 1831.

The intention of this patentee is to construct a hook which shall disengage itself whenever the weight which it may be employed in supporting is supported on something else. In lowering a ship's boat, for instance, with tackle furnished with these hooks, the boat would become disengaged from the tackle whenever it is sufficiently lowered to be supported by the water. This is effected by making the hook to turn upon a pivot in connection with the block or pulley frame, and carrying the stem of the hook past the pivot, where it is enlarged into a counterpoise sufficiently heavy to descend and cause the hook to turn back out of the ring or eye which it occupies, as soon as the weight is removed, to permit the counterpoise to act.

This contrivance is shown by fig. 2, Pl. XVII. in which *a* represents the pulley and block; *b* an iron strap descending considerably below the block on each side; *c* is the hook connected to the strap by the pivot *d*, on which it is permitted to turn freely between the cheeks of the strap: *e* is a counterpoise which, when the hook has no weight attached to it, descends and turns it up to the position represented by the dotted lines; and by this means the tackle is disengaged whenever the hook ceases to support weight. This appears to be a simple and ingenious contrivance, and in many instances it may prove useful.

SUGAR, EXTRACTING MOLASSES FROM.—To Moses Poole, of Lincoln's Inn, Gentleman, a patent "for certain improvements in the apparatus used for certain processes of extracting molasses or syrup from sugar," was granted on the 29th of June, 1830, and the specification was enrolled in the Enrolment Office on the 29th of December, 1830.

Mr. Poole's plan of facilitating the extraction of molasses or syrup from sugar, consists in the employment of a Torricilian or condensed steam vacuum below the vessel containing the sugar to be purified. If the altitude of the premises in which the operation is carried on permit, he prefers the first mode, but if it be desirous to carry on the operation at an elevation less than thirty feet, he obtains a vacuum by filling a vessel with steam and then condensing it. The vacuum vessel is to be placed under the sugar vessel; and if in connection with a pipe of sufficient length, it is to be filled with water and stopped air-tight. The water being then permitted to escape at the bottom of the long pipe, will descend until it becomes counterpoised by the atmosphere, when a Torricilian vacuum will be obtained in the vessel. When steam is to be employed to render the vessel vacuous, it is introduced near the bottom while the air is permitted to escape at the top; and when the air is entirely expelled, the air passage is closed, and a jet of cold water is forced into the vessel, by which the steam is condensed and the water descends below a stop cock in a pipe at the bottom, by which it can be stopped off, leaving the vessel vacuous as before. The arrangements of the other parts of this patentee's apparatus not being essentially different from those in common use, it becomes unnecessary to detail them here.

SUGAR, WHITENING.—To Edward Turner, of Gower Street,

in the county of Middlesex, M. D. and William Shand, of the Burn, in Kincardineshire, Esq. a patent for "a new method of purifying and whitening sugar or other saccharine matter," was granted on the 29th of June, 1830, and the specification was enrolled in the Enrolment Office on the 29th of December, 1830.

These patentees propose to employ the pressure of an hydraulic column to force water through the crystallized sugar, in order to facilitate the processes of washing away the colouring matter and impurities.

Having placed the sugar in a vessel of the usual form, and an appropriate size, with a perforated bottom covered with cloth, to prevent the escape of the sugar, and having placed a second cloth on the top of the sugar, a cover is firmly secured to the top of the vessel by a series of screws passing through the cover and into a circular flanch on the rim of the vessel. Through the middle of this cover a pipe is passed, which is carried about fifteen inches upwards.

The upper extremity is provided with a funnel for the supply of water or syrup employed to whiten the sugar or other saccharine matter.

Locomotive Machines.—To John Henry Clive, of Chell House, in the county of Stafford, Esq. a patent for "certain improvementss in the construction of, and machinery for, locomotive ploughs, harrows, and other machines and carriages," was granted on the 1st of July, 1830, and the specification was enrolled in the Enrolment Office on the 29th of December, 1830.

Two objects are contemplated by this patentee; the one is the enlargement of the wheels on which the loco-motive machine is supported and moves, and the other, the enlargement of the radius of the crank, by which the rotation of the bearing wheels is produced.

He considers that the bearing wheels might be varied according to circumstances, from about five to ten feet: and that the radius of the cranks should vary according to the quality of the road or land, if employed for ploughing and harrowing, on which they are to be employed, from about eighteen to twenty-four inches.

The patentee does not specify any particular mode of constructing his enlarged wheels and cranks, but simply confines his claim, we suspect unadvisedly, to the increased size. In this remark, we would not by any means be understood to condemn

the proposed improvements, for the advantages of large wheels have been long established; and on the subject of large cranks we subjoin the following

LETTER FROM THE PATENTEE.

TO THE EDITOR.

SIR,—Being a regular subscriber to your useful work, I expect I shall see in your next number, an abstract of my patent improvements in loco-motive machines; the specification of which has lately been enrolled. I, therefore, send you a few brief remarks on one of the principles of those improvements, which I proved by experiments three years ago.

Let *a b*, fig. 6, Pl. XVII. be a loco-motive carriage wheel five feet diameter, bearing say one ton: let *c* be a stone rut or acclivity of a hill two inches high. Of course the whole ton must be lifted over the peak of this obstacle *c*, before the wheel can go forward. Then let *d* be a crank or pin in the wheel, nine inches radius, to which the motive power is applied. This power when carried by the wheel acts, not like the draught of a horse, but only in the direction *d e*, (you must please to allow this as a fact, unless you can plainly prove it erroneous, as on it one grand principle of the theory of loco-motive action depends, a theory that I believe, has never yet been correctly explained). I presume you will at once admit, that no force in the direction *d e* can propel the wheel over *c*. It may turn it round, twist out the spokes, or grind it into the earth, but over *c* it can never go; because *c* becomes a fulcrum, and the power is on the same side the fulcrum as the weight, and acting in the same direction: but let the power be removed beyond the fulcrum towards *b*, acting in the direction *b f*, and the wheel will at once go forward, whatever be its weight, or whatever be the ascent, under about twelve inches at a yard, (that depending on certain other circumstances), provided the power and leverage be, as in other machines, proportioned to the weight. Not knowing, or overlooking this simple principle, has caused all the loco-motive machines to fail in surmounting steep ascents or bad roads when their momentum or previously acquired velocity was exhausted. So long as the fulcrum is between *c* and *g*, the wheel or carriage will go on, if power sufficient be applied; but, if once the fulcrum be between *c* and *f*, no power, however great, (acting as aforesaid) can propel the vehicle. Mr. Gurney, I presume, thought by his contrivance called "carriers," to transfer the power to the rims of the wheels; but it would not do;

he knew his power to be strong, yet found his wheels weak and his carriage stationary; because he was forcing at or near the fulcrum all the time, and had no leverage, or worse than none.

It is not my intention now to go further into the theory of locomotion; there are other points, equally essential with the foregoing, to the perfect action of a loco-motive machine, and which would have been noticed in my specification, but for the absurdity and oppressive nature of our patent laws.

So many difficulties beset the introduction of a new invention, that I am in little expectation of emolument from my patent speculations; however, I please myself with the thought, that whenever loco-motive carriages on plain wheels shall be made to travel through all the difficulties of common turnpike roads, (although I am of your opinion, that we want the child to run before it can walk) it must be by the application of my patented improvements, as the immutable laws of mechanics forbid it to be otherwise.

I am,

Sir,

Your most obedient Servant,

J. H. CLIVE.

Chell House,
January 4th, 1831.

LAMP.—To Samuel Parker, of Argyle Street, in the county of Middlesex, Bronzist, a patent for "an improved lamp," was granted on the 29th of June, 1830, and the specification was enrolled in the Enrolment Office on the 29th of December, 1830.

It has been deemed so important to constitute the pillar of a table lamp into a reservoir for the oil, with the means of raising an abundant supply, that the contrivances for raising the oil from the pillar to the burner are almost innumerable. Some have employed pumps actuated by wheel work to force up the oil; some, the action of a column of mercury; some have employed the elastic force of air condensed by pumps, or by an hydraulic column.

The latter principle is adopted by the present patentee; who employs two vessels, one situated near the top, and the other, near the bottom of the pillar. These vessels are joined together by pipes, similar in principle to those employed in Hero Fountain. A pipe proceeds from the top of the pillar to nearly the bottom of the lower vessel, by which it is to be filled with oil. Then from the top of the lower vessel a second pipe proceeds to nearly the top of the upper vessel, by which, when the lamp is inverted, the oil is transferred from the lower to the upper vessel.

A third pipe proceeds from the burner to very nearly the bottom of the upper vessel. Now when the lamp is placed upright, and oil poured into the pipe which proceeds from the top of the pillar to the bottom of the lower vessel, the air contained therein will be forced up through the other pipe to the upper vessel, and by its pressure on the surface, the oil will be forced up to the burner. The pipe through which the oil is supplied is enlarged into a kind of reservoir at the top, that the altitude of the column, and consequently, the supply of oil to the burner may continue for a considerable time uniform.

Mechanical Power from Chemical Agents.—To Samuel Parker, of Argyle Street, Oxford Street, in the county of Middlesex, Bronzist, a patent for "certain improvements in producing mechanical power from chemical agents," was granted on the 29th of June, 1830, and the specification was enrolled in the Enrolment Office, on the 29th of December, 1830.

The power proposed, is the pressure of hydrogen gas on the surface of a liquid, by which it is forced through a pipe to an elevated situation; the gas being generated by the decomposition of zinc in very weak diluted sulphuric acid, contained in a close vessel. Mr. Parker gives an instance of the application of this power to raising oil from a reservoir in the pillar of a table lamp to the burner. Near the top of the pillar is an oil vessel, with a pipe from the burner descending to very nearly its bottom, and a second or gas pipe descending from the top of the oil reservoir to the gas generating vessel, situated in the lower part of the pillar. In this lower vessel the tapering point of a small rod or pencil of zinc is immersed in the acid, and descends as it is decomposed, by which an equal portion of zinc is always exposed to the action of the acid, and thus a uniform quantity of gas is generated, which passes up the gas pipe and presses on the surface of the oil, so as to raise it up to the burner and occupy its place as the consumption proceeds.

Self-acting Spinning Machines, &c.—To Richard Roberts, of Manchester, in the county of Lancashire, Civil Engineer, a patent for "a certain improvement or certain improvements in the mechanism employed to render self-acting, the machines known by the name of mule, billy, jenny, jack frame or stretching frame, and all other machines of that class, whether the said machines be used to rove, slub, or spin, cotton or other fibrous

substances," was granted on the 1st of July, 1830, and the specification was lodged in the Enrolment Office, on the 29th of December, 1830.

It would be impossible to make all the minutiæ of this invention clear without a drawing and description far more extensive than would be interesting to the generality of our readers; and, therefore, we shall content ourselves with adding to the foregoing title, a brief notice of the principle on which the self adjustment of the movements of the various parts of the machines depend.

The limitation of the end motion of the reel or bobbin, on which the material under manufacture is to be wound, is regulated by a vibrating lever, whose length is continually varying through the medium of a traversing screw. This screw is put in rotation by a train of bevel gear, and the nut forming the connection with the parts, whose motions are to be regulated, being prevented from turning round, is made to traverse lengthways on the lever. The motion of the drum or barrel which turns the spindles is continued while their carriage is drawing in, by uncoiling a portion of the cord attached to the drum, while the tension is preserved by the alterations which at the same time takes place in the length of the lever arm.

Economical Oven.—To Robert Hicks, of Conduit Street, in the parish of Sr. George, Hanover Square, in the county of Middlesex, Surgeon, a patent for "an economical apparatus or machine to be applied in the process of baking, for the purpose of saving materials," was granted on the 29th of June, 1830, and the specification was enrolled in the Petty Bag Office on the 29th of December, 1830.

In the process of fermenting the paste or dough for the manufacture of bread, a quantity of alcohol or spirits of wine is generated, which is subsequently vapourized by the heat of the oven and lost. This loss is by no means inconsiderable; and great credit is, we think, due to Mr. Hicks, for bringing this important product of fermentation under the notice of the public, by the invention of a very complete apparatus calculated to realize those advantages which theory and reason seem to promise.

It will be readily conceived that the numerous small fissures in an ordinary oven of *brickwork*, arising from imperfect fittings and other causes, render the material unfit for the preservation of the vapours given off: Mr. Hicks accordingly employs an oven made of *iron* in lieu of brick; but the bottom of the oven on the interior

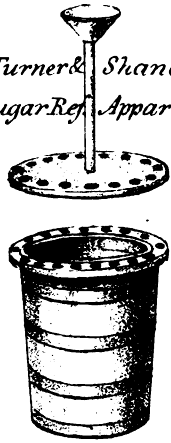
side is lined with a pavement of bricks, on which the loaves are placed as usual; a fire is made underneath the oven, at a proper distance, and brick flues from thence are so arranged that the heated air shall envelope every part of the exterior of the oven, to diffuse the heat in the interior of it as uniformly as is practicable. The door of the oven is made to fit the frame accurately, by grinding their surfaces, or by luting when set to work, and these parts are brought into firm contact by a cross bar and screw in the usual manner of fastening the mouths of retorts.

In the drawings accompanying the specification two modifications of the apparatus are exhibited. The first is an oblong oven five feet wide and seven feet long, and the fire place, or grated receptacle for the fuel, is placed underneath the middle of the bottom, and is framed so as to be drawn parallely with the length of the oven, backward or forward, or to be drawn entirely out of the apparatus when required. By the usual position of the fire, however well regulated may be its intensity, there is a liability of the central part of the bottom of the oven becoming over-heated; partly owing to the bottom being lined, internally, with so bad a conductor of heat as bricks. To protect the oven from this injurious effect, a large plate of iron, about half the area of the oven, and twice that of the fire, is suspended by a hooked iron bar centrally to the bottom of it; and being posited about midway between the fuel and the bottom of the oven, prevents the flame and heated gases from acting directly upon the bottom of the oven. The door of the ash-pit is provided with an air regulator, and the minor flues around the oven (made by numerous holes in the brickwork) unite in the upper part, where a horizontal flue leads into a common chimney.

In the centre of the top of the oven a large iron tube or neck, about twelve inches in diameter and thirty inches long, is fixed vertically, extending through the brickwork which covers the oven. In this tube the vapours from the bread are collected, and are conducted from thence by a lateral tube into a common distiller's worm, which being surrounded by cold water the vapours become condensed, and are drawn off into a proper receiver for the liquid. This liquid, consisting of a mixture of water, alcohol, and other matters, being afterwards rectified, a fine spirit of wine will be the result.

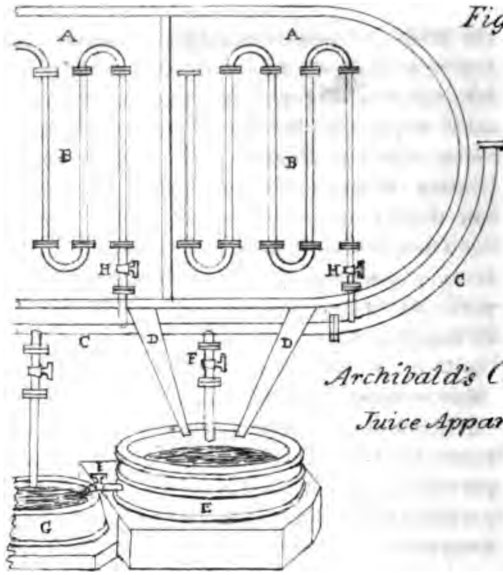
In order to regulate the temperature of the oven, an iron tube about the size of a musket barrel, closed solid at the lower end, and about a foot long, is suspended vertically in the middle of

Fig: 1.



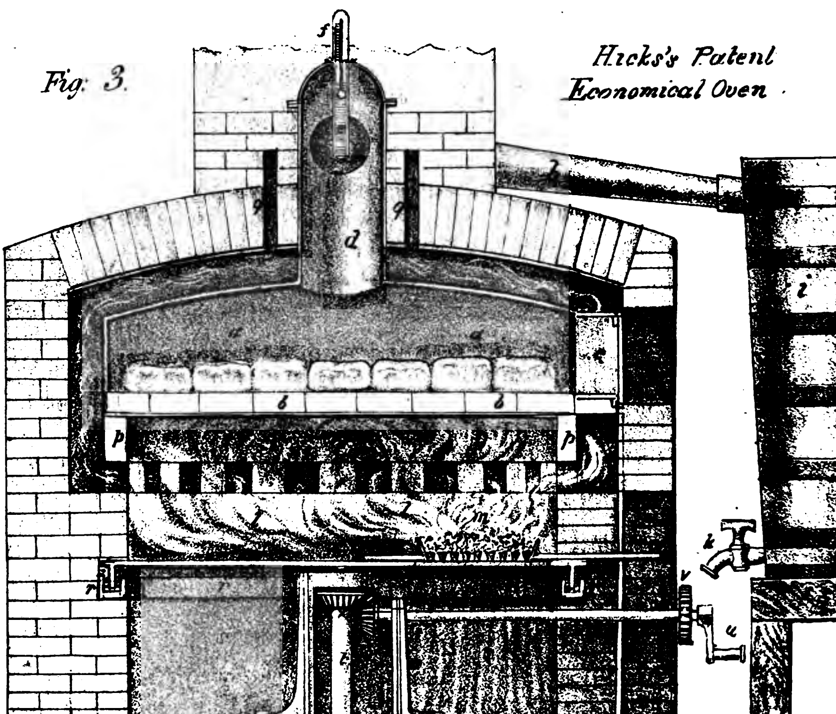
Turner & Shand's Sugar Ref. Apparatus

Fig: 2



Archibald's Cane Juice Apparatus

Fig: 3.



Hicks's Patent Economical Oven.

Drawn on Stone by L. Hebert

1 Feb. 1881

the neck, by passing through a tapered hole in the top of the latter, whereon the tube rests by its upper end, which is spread out into a conical or bell-mouthed form for that purpose. In this tube oil is deposited, and into the oil is placed the bulb of a thermometer, whose graduated scale above, extending outside of the apparatus, exhibits the temperature of the oil, and consequently, also that of the oven.

The other modification of the machine described in the specification varies from the preceding in the arrangement of the furnace part. In the first, the fire-grate was *stationary* during the baking, in the second, which we have now to describe, it is made to *revolve*. For this purpose the oven is made circular, and at a suitable distance from the bottom of it, (about a foot) is a large circular plate of the same diameter as the oven, (six feet) which turns in a horizontal plane, on a vertical axis, forming a complete partition between the fire-place and the ash-pit; except in a portion of the circle where the *fire-grate* is situated, which is nearly of a sectorial form, to afford a more uniform distribution of the heat, and a greater facility of pushing the grate into, or drawing it out of its place, under the oven. In order that the air which is admitted into the ash-pit to promote the combustion may not be diverted from its proper course, that of passing through the grate on which the fuel is deposited, the patentee makes the whole circumference of the revolving plate air tight by what is termed an hydraulic joint. Near to the periphery of the circular plate, is fixed a descending rim of three or four inches deep, which dips into a circular trough, filled with water, that rests upon the brickwork surrounding the ash-pit; and the revolving plate being wholly supported upon its central axis, the part of the apparatus is rendered as complete in its action as it is simple in form. The motion is communicated to the grate by bevil-gear of the usual kind.

At Pl. XVIII. fig. 3, is a diagram affording a sectional view of the last mentioned modification of this baking machine. *a a* is the iron oven; *c c* the brick-floor made level with the bottom of the door-way *b*: *d* the chamber where the vapours from the bread are collected; *e* the oil tube suspended by its bell-mouthed end in a hole at the spherical extremity of the vapour chamber; *f* the thermometer with its bulb immersed in the oil contained in the tube: *g* a large aperture through which the vapour escapes into the crane-neck *h*, leading into the refrigerating worm-tub *i*, wherein the vapour becoming condensed is drawn off by the cock *k*

into a proper recipient. *l l* is the fire place, of which *m* is the grate, resting between ledges on the large circular revolving plate *n n* ; *o o o* are lateral apertures or flues in the brickwork, leading to the general surrounding flue *p p*, which terminates in the flue *q q*, leading to a common chimney, not represented in the drawing. *r r r* shews the circular water trough into which the descending rim of the revolving plate dips throughout its circumference. *s s* is the ash-pit; *t* the vertical axis of the revolving plate, to which motion is communicated, either by a boy turning the handle *u*, (or any convenient power applied to the pulley *v*,) which actuates the bevil-gear W and X. At Y is a register to regulate the admission of air to the fire.

When the thermometer indicates a temperature of 280° Farenheit, the oven is at a proper heat for the baking of bread, during which process, the heat should be maintained at from 280° to 310°, and the vapour drawn off through the refrigeratory, for subsequent rectification to obtain the vinous spirit. After the bread has been baked and the pastry (as customary) is introduced into the oven, the action of the condensing apparatus is dispensed with; which is effected by turning the cock at the worm-tub, and the oil tube and thermometer being withdrawn, the vapour escapes at the aperture thereby left open. In the baking of biscuit also, which like pastry, undergoes no fermentation, and therefore, contains no alcohol ready formed, the vapour is in like manner suffered to escape.

We are not sufficiently informed in the practical department of baking to say positively, that this new process is unexceptionable; yet in the absence of that essential knowledge to determine its absolute merit, our reason disposes us to think very favourably of the invention. The specification is unfortunately quite silent as to the extent of the resulting advantages; but to our minds, they appear to be far from a trifling nature, even supposing the quantity of alcohol obtained is not so considerable as we anticipate; fully sufficient we should judge to compensate for the trifling trouble of drawing off and condensing the vapour. It has indeed been often a matter of surprise to us, that no use whatever was made of this vapour; the alcohol in which is generated in precisely the same manner as the distillers and wine makers adopt, the only difference being in the less fluidity of the dough; but then we reflected upon what the chemical writers on the subject have told us, namely, that this fermentation is a beginning of a putrid fermentation in the gluten, an acid fermentation

in the starch, and a spirituous fermentation in the saccharine matter, and that the nature of the component parts are further materially changed by the operation of heat: (this was said by Fourcroy, and has we think been repeated by all the later writers), and to obtain a clean pure spirit from putrid exhalations, by an economical process, is a task that most persons would shrink from attempting. The patentee of this invention has, however, not suffered himself to be misled by books, but has wisely acted upon his own judgment and knowledge of the subject. We know that much of the common bakers' bread has an unsavoury odour, and this we think is rather owing to the introduction of corrupt or unsound materials, than emanating from the process of fermentation; because we have often noticed, that genuine bread, made from pure sound materials, possesses no bad odour; so far from it, the vapour arising from such bread, when just taken out of the oven, is highly agreeable from the predominance of alcohol, which is even sensible to the taste upon exhaling the vapour. Now as by the ordinary construction of bakers' ovens, there is no outlet for the vapour, whatever bad flavour may have previously been communicated to the dough by putrid yeast or musty flour, (heightened perhaps by the subsequent fermentation), becomes fixed in the bread; such bread being in fact baked by pernicious vapours. Viewing the ordinary process in this light, we are disposed to think that the adoption of Mr. Hick's oven, wherein the vapours are drawn off, would tend greatly to sweeten bread made from inferior materials; which would form a sufficient inducement for its use, without taking into consideration the product of alcohol. The subject of bread making being one of great interest and public importance, we have gone to an unusual length in our report of this invention; and as there is yet much to learn, we shall be much obliged by the patentee favouring us with some information as to the degree of success which has attended his efforts to improve the process of bread making.

We have yet one more remark to make;—who that has ever partaken of the baked meat and pies from a public oven, has failed to discover tastes and flavours quite foreign and illegitimate to the dish he is eating of,—arising from the variety of food contained in one oven? This inconvenience, by which many a good dish is rendered disagreeable, will be wholly prevented by Mr. Hick's oven.

LOOMS.—To John Harvey Sadler, of Praed Street, Paddington, in the county of Middlesex, a patent for "certain improvements in looms," was granted on the 1st of July, 1830, and the specification was deposited in the Enrolment Office, on the 1st of January, 1831.

The improvements contemplated by this patentee consist, in an arrangement of two looms, placed with their cloth beams towards each other, and so situated that one man can actuate and attend to both at the same time. The looms are strongly framed together at such a distance from each other as to allow room for a man to put in oscillation, a large pendulum between them. This pendulum gives alternate motion to a set of similar sectors, cranks, and levers, at the top of each loom, and these actuate, through the medium of connecting rods and lines, the shuttle, the gear by which the opening for the passage of the shuttle is made, and the batton or lay.

A method of actuating the looms by the rotation of a shaft, with various cams for the different motions, is also described in the specification, which is accompanied by a set of drawings beautifully executed in lithography.

We have said enough to give the reader a general idea of this invention; but there are several arrangements for the production of the various simultaneous and successive motions necessary in weaving, so ingenious, as to deserve a more particular notice on a future occasion, when we have an opportunity of making the requisite drawings.

CARRIAGE WHEELS.—To Augustus Whiting Gillett, of Birmingham, in the county of Warwick, Merchant, a patent for "an improvement in the construction and application of wheels to carriages of pleasure or of burthen; or to machines for moving heavy bodies," was granted on the 4th of November, 1830, and the specification was enrolled in the Rolls Chapel Office on the 3rd of January, 1831.

The preamble to the specification of this patent informs the reader, that the "improvement" above mentioned is the invention of a person in North America, whose name we forget, but whom we fear was "too far north" for the patentee. The invention consists of "a wheel within a wheel;" which may be more particularly specified, by saying it is "a wheel that carries its own railway:" so many times has the thing been proposed and abandoned, that this definition is well known to mechanics. We

Calvert's Patent Saddle

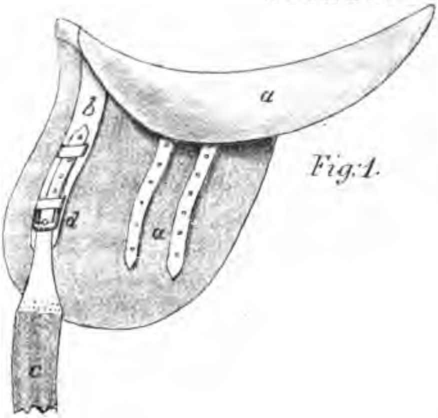
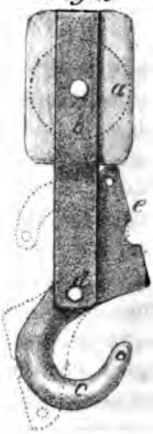


Fig. 1.

Fig: 2



Shore's Patent Tackle Locks

Gillet's Patent Carriage Wheels

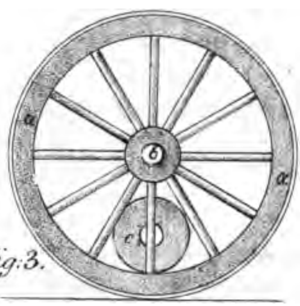


Fig: 3.

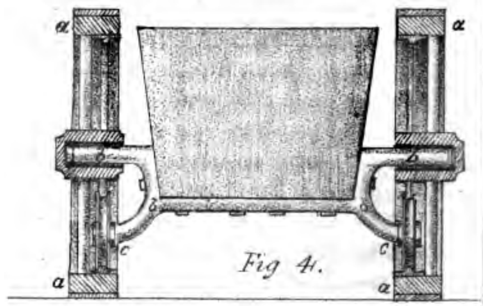
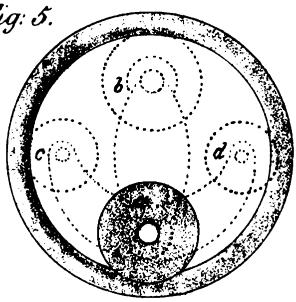


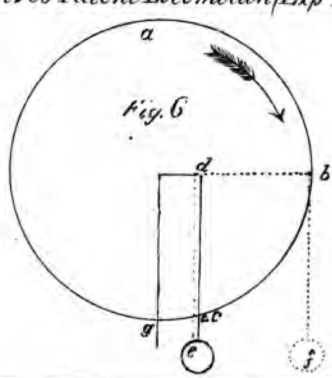
Fig 4.

Fig: 5.



Hunter's Patent Wheels (Exp^{y} D)

Clive's Patent Locomotion (Exp^{y} D^{m})



Drawn on Stone by L. Hebert.

1. Feb^{y} 1831

really thought that it had long ago been wheeled out of the catalogue of useful inventions; years back it was fairly wheeled out of England; but it appears to have floated over to America, where being picked up by Jonathan, he regards it as the wheel of fortune, posts over to England, and sells as a grand and original discovery, to John Bull himself, his own rejected wares. We have lately had occasion to notice several facts of this kind; as though it were a trade going forward in repatenting old English inventions from "communications made by foreigners residing abroad." If we could spare the time, we could shew up a pretty list of these, and of the agents who pocket the fees for such business;—we do not accuse the latter of dishonesty in passing such patents, but their ignorance of mechanical inventions equally affects the pockets of patentees; whom it behoves to be a little more circumspect in the choice of the persons whose assistance or advice they may require, when about to patent their discoveries.

We have seen this invention before under various disguises, and we now give a diagram of it, more as a caution to future patentees, than on account of its merit.

Fig. 3, Pl. XVII. is a side elevation of the wheel and its juvenile companion, and fig. 4 shews two such wheels edgewise in section, as applied to a tram-waggon; the same letters of reference indicating similar parts in each figure. *a a* is a large wheel of a common description, and turning loosely (with considerable play) on the axles *b b*, which is made in the form represented to obtain strength, and having curved arms which form the axes of the little wheels *c c*; these are grooved on their peripheries to fit circular edge railways *d d*, fixed inside the felloes of the large wheels. The weight of the waggon and its load rests upon the little wheels, and the weight of the latter as well as the former necessarily rest upon the felloes of the large wheels, threatening, as they do at all times, to do them some grievous injury in these, their most tender parts. The specification however endeavours to make it appear, that the obligations of the senior and junior wheels are reciprocal; that the old ones roll more blythely over the obstacles of the common road, notwithstanding the increased weight of the young ones and their railways, &c. The patentee takes no notice of the increased friction, and of the reduced leverage of the young wheels—such things being "trifles light as air," and quite unworthy the attention of aspiring genius. It is undoubtedly true, that the little wheels make railways of the

large wheels, albeit such railways are not very level, but partake of all the agreeable undulations of the common road, and very faithfully transmit all the shocks and thumps received therefrom to the little wheels and their great loads; but then, if we recollect rightly, the old advocates of the wheel within a wheel, used to argue, that "*the little wheels running a little in advance of the large ones, the weight of them and their load operated to propel the carriage forward upon its railway.*" This was arriving at perpetual motion by a hop, step, and a jump; just as cleverly as Mr. Herapath, who in his scientific letter in the Times newspaper about eighteen months ago, said, the greater the weight upon the hind wheels of Mr. Gurney's carriage, the more easily would it surmount the obstacles opposed to its progress;—or something to that effect.

To return to the wheel within a wheel, it is scarcely necessary to remark, in reply to the above remark in italics, that the little wheel cannot get in advance of the large one, without having had previously an excess of power applied to it (as it then *rises up* the railway), only a portion of which excess is returned by the rolling on of the large wheel, after passing the obstruction which occasioned the little wheel to be *pulled up* beyond the axis of the large one.

Having said thus much relative to the imported discovery, it remains to shew that it is not new. We have a perfect remembrance of several propositions of the kind, though we can at this moment only refer to the name and date of one, namely, the patent of Mr. George Hunter, of Edinburgh, in the year 1826, the specification of which may be read at the Rolls Chapel Office. By his plan the waggon was supported on small wheels, the peripheries of which were grooved for the reception of the edge of the "railway" fixed on the interior side of the felloes of the large wheels; and he distinctly claims as his invention this principle of construction, and shews several modifications of it. Mr. Hunter constructed and had in use, some waggons in which this invention was applied; some of them had only one little wheel, as represented in full lines at *a*, fig. 5, Pl. XVII. others had two wheels, as *a* and *b*, and others three wheels, as *a c d*. We have not heard whether they are still in use, but we feel no difficulty in guessing that they are deceased; and Jonathan no doubt "guessed" that they were forgotten also.

HAT DYEING.—To John Bowler, of Castle Street, Southwark, in the county of Surrey, Hat Manufacturer, a patent for "certain improvements in machinery employed in the process of dyeing hats," was granted on the 4th of November, 1830, and the specification was enrolled in the Enrolment Office, on the 3rd of January, 1831.

The process of dyeing hats consists in immersing them in a dye liquid several times, and alternately exposing them to the action of the atmosphere: and as the dye liquid drains from the hats when they are taken out of the dye kettle, it has a tendency to accumulate on the lower side, and render the dyeing unequal. To counteract this tendency it has been found necessary to suspend the hats to dry with a different side upwards, every time they are taken out of the liquid.

To facilitate this change of position for each dip of the hat, is the object of Mr. Bowler's patent. He employs a large skeleton square frame, around the interior of which, and along a skeleton partition which crosses its middle, there are fixed pegs, sufficient for carrying six dozen of common sized hats, three pegs being provided for each hat. These pegs fit into three holes in the hat block, a hole being made in each of the pieces of the block, and by these means the pieces are kept together when the hat becomes by saturation with liquid too flexible to retain them in their places. Doors on two opposite sides of the frame open to facilitate the placing and removing of the hats. And the frame is suspended from a bar extending across at some distance from the top, with its ends bent downwards half way to the bottom, where they are perforated, for the reception of two pivots fixed in the frame. By these means, after the first dip, the position of all the hats on the frame is at once changed, by turning the frame half a revolution on its pivots, when it is again immersed. It is then turned a quarter of a revolution, and immersed a third time in the dye kettle. And lastly, it is turned half a revolution again, and immersed, by which four different parts of the hats have been upwards when raised from the kettle. The skeleton frame is to be made of copper, or any other suitable material which will not be injured by the liquid employed in dyeing. The frame is raised and lowered with much facility by a set of pulleys.

This elegant, expeditious, and cleanly method of effecting the necessary alterations in the positions of the hats, during the operation of dyeing, is highly creditable to the patentee, whom we doubt not will reap much benefit from his ingenuity.

Sieves.—To William Wedd Tuxford, of Boston, in the county of Lincoln, Miller, a patent for "a machine or apparatus for cleansing or purifying wheat, grain, or other substances," was granted on the 6th of July, 1830, and the specification was lodged in the Enrolment Office, on the 6th of January, 1831.

The invention of Mr. Tuxford applies principally to the means of communicating the power of water, wind, steam, or other first mover, to a series of sieves at the same time. He proposes to suspend each sieve by three wires or chains, of considerable length; and under the middle of each sieve is placed an upright spindle, which is to be put in rotation by drum or barrel, and band. On the top of each spindle is fixed a crank, the upper end of which turns loosely in a bar extending across the bottom of the sieve. Now this spindle and crank being put in rotation will evidently communicate to the sieve a motion very similar to hand-sifting. The methods by which the spouts for charging the sieves are opened and closed, and the arrangement by which the cleansed grain is delivered at one side and the dust and small seeds at the other, though convenient and useful, do not possess novelty sufficient to justify a particular description; but we hesitate not to say, that the arrangement as a whole will be found to answer the purpose for which it has been designed.

Sheathing and Roofing Plates.—To Matthew Uzzielli, of Clifton Street, Finsbury Square, in the county of Middlesex, Gentlemen, a patent for "improvements in the preparation of certain metallic substances, and the application thereof to the sheathing of ships, and other purposes," was granted on the 6th of July, 1830, and the specification was enrolled in the Enrolment Office, on the 6th of January, 1831.

The metallic substance proposed to be employed by Mr. Uzzielli, for sheathing ships, covering buildings, &c. is, an alloy of 100 parts of copper, and from 5 to 7 parts tin, which he finds advantageous for such purposes, being less oxidizable than copper or brass, that contain a considerable proportion of zinc. And to render this alloy ductile, he proposes, after having cast it into plates of from three-eighths to three-fourths of an inch thick, and of length and breadth appropriate to the purposes for which the plates are intended, to heat them slowly in an annealing or other furnace, occupying two or three hours in bringing them up to a dull red heat; they are then gradually cooled, occupying not less than an hour in cooling them. When more tin is used, the mixture

is more brittle, and a greater length of time will be required both in heating and cooling: but if a less proportion of tin be employed, the mixture, though more oxidizable, will be less brittle, and require less time in heating and cooling to anneal it. After the annealing, the plates are to be four or five times passed through laminating rollers, under such a pressure as shall not lengthen them more than half an inch in two feet each time. They are then to be again annealed, and again submitted to the action of the rollers, taking care to laminate them in the same direction each time. This process is to be continued till the alloy loses its crystalline appearance on its being fractured, which will be the case after the process has been repeated twelve or fifteen times. The pressure of the rollers may then be made to lengthen the plates about six inches in every two feet. They may now be passed through the rollers double or four fold, according to their intended thickness. The patentee states, that a small portion of zinc may be introduced, but as it is apt to render the mixture oxidizable, it should not exceed in quantity one per cent. and that it had better be entirely omitted.

SAFETY BOAT.—To W. Dobree, of Fulham, Middlesex, Gentleman, a patent for "an independent safety boat, of novel construction," was granted on the 5th of August, 1330, and the specification was deposited in the Enrolment Office on the 8th of January, 1831.

In what the independence of Mr. Dobree's boat consists we have not been able to discover, but its safety, which is doubtless of much greater importance, consists in the introduction of vessels to contain a quantity of air, sufficient to render the boat with all its passengers and crew, buoyant, though filled with water. Twenty-six feet long, seven feet wide, and three feet deep, are given as appropriate dimensions for the safety boat of a frigate. The boat contains three principal divisions, the first, or lower, being made open to the sea, is called a ballast division, then comes a strong deck, to prevent the ascent of water farther than the lower division. Along each side of this deck is fixed an air tight copper tube, about nine inches in diameter, extending all the length. Besides these, there are introduced a number of square air tight vessels, which constitutes, with the tubes, the safety of the boat. The second division is a small space between the decks for the passage of water which may be dashed into the

boat. From this division the water is permitted to escape through scuppers of the usual construction. The third division, which is above the second deck, is appropriated to the crew and passengers, being provided with the usual thwarts and other conveniences for the rowers. A recess is made at the stern of the boat for the steersman, and a similar recess at the stern for holding an anchor and other appendages.

CHAIR, RECLINING—To George Minter, of Princess Street, Soho, in the county of Middlesex, Upholsterer, Cabinet and Chair Manufacturer, a patent for "an improvement in the construction, making, or manufacture, of chairs, which he intends to denominate 'Minter's reclining chairs'," was granted on the 9th of November, 1830, and specification was enrolled in the Enrolment Office on the 8th of January, 1831.

The construction of a recumbent chair, which shall be so far self acting that the occupier can at pleasure give any required degree of inclination to its back, without any other exertion than a transfer of pressure from the seat to the back, when he wishes to increase the inclination, and from the back to the seat when he wishes to diminish the inclination, has been the object of this patentee, and he seems to have accomplished it by arrangements at once simple and efficacious. The hind legs of the chair are extended a small distance above the seat, and at their tops they are provided with pivots, on which the reclining back turns, both the tops of the legs and the side rails of the back being strengthened by side plates of metal. These plates on the side rails of the back are continued below the pivots, and turned at right angles outwards from each other, passing under the back ends of the side rails of the seat, the seats front being supported by a pair of hinges which attach the seat to the front rail of the principal frame, within which the seat moves. Now by this arrangement it will be perceived, that when the whole weight of a person is on the seat of the chair, the back will assume an upright position, by the pressure on the shorter arms of the levers constituting the side rails; but whenever a portion of pressure is transferred from the seat to the back, or longer arms of the levers, the seat will be partially elevated, and the back will assume a position of inclination proportionate to the pressure applied to it; at the same time it will in all positions afford sufficient resistance to be convenient and comfortable to the person occupying the chair.

ON GUN POWDERS AND DETONATING MATCHES.

In the last number (Oct. 1830.) of the Quarterly Journal of the Royal Institution, a luminous paper on the manufacture of the above-mentioned important compounds, from the pen of Dr. Ure, is inserted. That able chemist commences his paper by observing, that

"Gunpowder is a mechanical combination of nitre, sulphur, and charcoal; deriving the intensity of its explosiveness from the purity of its constituents, the proportion in which they are mixed, and the intimacy of the ad-mixture." He next proceeds to examine and explain the various processes adopted for preparing each ingredient, with great minuteness, in three separate articles and then by a fourth article.

The mode of mixing the Constituents and forming the Powder.

The three ingredients being thus prepared, are ready for manufacturing into gunpowder; they are, 1st, separately ground to a fine powder, which is passed through proper silk sieves or bolting machines; 2nd, they are mixed together in the proper proportions, which we shall afterwards discuss; 3rd, the composition is then sent to the gunpowder-mill, which consists of two edge stones of a calcareous kind, turning by means of a horizontal shaft, on a bed-stone of the same nature, incapable of affording sparks by collison with steel, as sand-stones would do.* On this bed-stone the composition is spread, and moistened with as small a quantity of water as will, in conjunction with the weight of the revolving stones, bring it into a proper body of *cake*, but by no means to a pasty state. The line of contact of the rolling edge-stone is constantly preceded by a hard copper scraper, which goes round with the wheel, regularly collecting the caking mass, and bringing it into the track of the stone. From fifty to sixty pounds of cake are usually worked at one operation under each millstone. When the mass has thus been thoroughly kneaded and incorporated, it is sent to the corning-house, where a separate mill is employed to form the cake into grains or corns. Here it is first pressed into a hard firm mass, then broken into small lumps, after which the corning process is performed by placing these lumps in sieves, on each of which is laid a disc or flat cake of *lignum vitæ*. The sieves are made of parchment skins, perforated with a multitude of round holes. Several such sieves are fixed in a frame, which, by proper machinery, has such a motion given to it, as to make the *lignum vitæ runner* in each sieve move about with considerable velocity, so as to break down the lumps of the cake, and force its substance through the holes, in grains of certain sizes. These granular particles are afterwards separated from the finer dust by proper sieves and reels.

* A drawing and description of an improved gunpowder mill are given in our vol. i. p. 353, first series.

The corned powder must now be hardened, and its rougher angles removed, by causing it to revolve in a close reel or cask, turning rapidly round its axis. This vessel resembles somewhat a barrel-churn, and is frequently furnished inside with square bars parallel to its axis, to aid the polish by attrition.

The gunpowder is finally dried, which is now done generally with a steam heat, or in some places by transmitting a current of air, previously heated in another chamber, over canvass shelves, covered with the damp grains of gunpowder.

On the Proportion of the Constituents.

A very extensive suit of experiments, to determine the proportions of the constituents for producing the best gunpowder, was made at the Essonne works, by a commission of French chemists and artillerists in 1794.

Powders, in the five following proportions, were prepared :—

	Nitre.	Charcoal.	Sulpur.	
1	76	14	10	Gunpowder of Bâle.
2	76	12	12	Gunpowder works of Grenelle.
3	76	15	9	M. Guyton de Morveau.
4	77.32	13.44	9.24	Idem.
5	77.5	15	7.5	M. Riffaut.

The result of more than two hundred discharges, with the *proof-mortar*, shewed, that the first and third gunpowders were the strongest, and the commissioners in consequence recommended the adoption of the third proportions; but a few years thereafter it was thought proper to substitute the first set of proportions, which had been found equal in force to the other, as they would have a better keeping quality, from containing a little more sulphur and less charcoal. More recently still, so strongly impressed have the French government been, with the high value of durability in gunpowders, that they have returned to their ancient *dosage* of seventy-five nitre, twelve and a half charcoal, and twelve and a half sulphur. In this mixture the proportion of the substance, powerfully absorbent of moisture, viz. the charcoal is still further reduced, and replaced by the sulphur or the conservative ingredient.

If we inquire how the *maximum* gaseous volume is to be produced, from the chemical reaction of the elements of nitre on charcoal and sulphur, we shall find it to be by the generation of carbonic oxide and sulphurous acid, with the disengagement of nitrogen. This will lead us to the following proportions of these constituents :—

	Hydrogen=1.	Per Cent.
1 prime equivalent of nitre	102	75.00
1 " " sulphur	16	11.77
3 " " charcoal	18	13.23
	136	100.000

The nitre contains five primes of oxigen, of which three, combining with the three of charcoal, will furnish three of carbonic oxide gas, while the remaining two will convert the one prime of sulphur into sulphureous acid gas ; the single prime of nitrogen is, therefore, in this view, disengaged alone.

The gaseous volume, on this supposition, evolved from one hundred and thirty-six grains of gunpowder, equivalent in bulk to seventy-five grains and a half of water, or to three-tenths of a cubic inch, will be, at the atmospheric temperature, as follows :—

	Grains.		Cubic inches.
Carbonic oxide	42	=	141.6
Sulphurous acid	32	=	47.2
Nitrogen	14	=	47.4
			236.2

being an expansion of one volume into 787.3. But as the temperature of the gases, at the instant of their combustive formation, must be incandescent, this volume may be safely estimated at three times the above amount, or considerably upwards of two thousand times the bulk of the explosive solid.

But this theoretical account of the gases developed, does not well accord with the experimental products usually assigned, though these are probably not altogether exact. Much carbonic acid is said to be disengaged, a large quantity of nitrogen, a little oxide of carbon, *steam of water, with carburetted and sulphuretted hydrogen.* From experiments, to be presently detailed, I am convinced, that the amount of these latter products, printed in italics, must be very inconsiderable indeed, and unworthy of ranking in the calculation ; for, in fact, fresh gunpowder does not contain above one *per cent.* of water, and can therefore yield little hydrogenated matter, nor is the hydrogen in the carbon of any consequence.

It is obvious, that the more sulphur is present the more of the dense sulphureous acid will be generated, and the less forcibly explosive will be the gunpowder. This is sufficiently confirmed by the trials at Essonne, where the gunpowder that contained twelve of sulphur and twelve of charcoal in one hundred parts, did not throw the *proof-shell* so far as that which contained only nine of sulphur and fifteen of charcoal ; the conservative property is, however, so capital, especially for the supply of our remote colonies and for humid climates, that it justifies a slight sacrifice of strength, which at any rate may be compensated by a small addition of charge.

Table of Composition of different Gunpowders.

	Nitre.	Charcoal.	Sulphur.
Royal Mills at Waltham Abbey	75	15	10
France, national establishment	75	12.5	12.5
French, for sportsmen	78	12	10
———, for mining	65	15	20
United States of America	75	12.5	12.5
Prussia	75	12.5	12.5
Russia...........................	73.78	13.59	12.63
Austria	76	11.5	12.5
Spain	76.47	10.78	12.75
Switzerland (a round powder)	76	14	10
Chinese	75	14.4	9.9
Theoretical proportions (as above) ..	75	13.23	11.77

On the chemical Examination of Gunpowders.

I have treated five different samples; 1. The government powder, made at Waltham Abbey; 2. Glass gunpowder, made by John Hall, Dartford; 3. The treble strong gunpowder of Charles Lawrence and son; 4. The Dartford gunpowder of Pigou and Wilks; 5. Superfine treble strong sporting gunpowder of Curtis and Harvey. The first is coarse-grained, the others are all of considerable fineness. The specific gravity of each was taken in oil of turpentine; that of the first and last three was exactly the same, being 1.80; that of the second was 1.793, reduced to water as unity.

The above density for specimen first, may be calculated thus :—

75 parts of nitre, specific gravity = 2.000
15 parts of charcoal, specific gr. = 1.154
10 parts of sulphur, specific gr. = 2.000

The volume of these constituents is 55.5, by which, if their weight 100 be divided, the quotient is 180.

The specific gravity of the first and second of the above powders, including the interstices of their grains, after being well shaken down in a phial, is 1.02. This is a curious result, as the size of the grains is extremely different. That of Pigou and Wilks, similarly tried, is only 0.99; that of the battle powder is 1.03, and that of Curtis and Harvey is nearly 1.05. Gunpowders thus appear to have nearly the same weight as water, under an equal bulk; so that an imperial gallon will hold from ten pounds to ten pounds and a half, as above shewn.

The quantity of water that 100 grains of each part with on a steam bath, and absorb when placed for twenty-four hours under a moistened receiver standing in water, are as follows :—

100 grs. of Waltham Abbey, lose 1.1 by steam-heat, gain 0.8 over water.

Hall	0.5	2.2
Lawrence	1.0	1.1
Pigou and Wilks	0.6	2.2
Curtis and Harvey	0.9	1.7

Thus, we perceive, that the large-grained government powder resists the hygrometric influence better than the others; among which, however, Lawrence's ranks nearly as high; these two are, therefore, relatively the best keeping gunpowders of the series.

The process, most commonly practised in the analysis of gunpowder, seems to be tolerably exact. The nitre is first separated by hot distilled water, evaporated, and weighed. A minute loss of salt may be counted on, from its known violatility with boiling water. It is probable, that a small proportion of the lighter and looser constituent of gunpowder, the carbon. flies off in the operations of corning and dusting; hence, analysis may shew a small deficit of charcoal below the synthetic proportions originally mixed. The residuum of charcoal and sulphur, left on the double filter paper, being well dried by the heat of ordinary steam, is estimated, as usual, by the difference of weight of the inner and outer papers. This residuum is cleared off into a platina capsule with a tooth-brush, and digested in a dilute solution of potash, at a boiling temperature. Three parts of potash are fully sufficient to dissolve out one of sulphur. When the above solution is thrown on a filter, and washed first with a very dilute solution of potash, boiling hot, then with boiling water, and afterwards dried, the carbon will remain; the weight of which, deducted from that of the mixed powder, will shew the amount of sulphur.

I have tried many other modes of estimating the sulphur in gunpowder more directly, but with little satisfaction in the results. When a platina capsule, containing gunpowder spread on its bottom, is floated in oil, heated to 400° Faht. a brisk exhalation of sulphur fumes rises, but at the end of several hours, the loss does not amount to more than half the sulphur present.

The mixed residuum of charcoal and sulphur, digested in hot oil of turpentine, gives up the sulphur readily, but to separate again the last portions of the oil from the charcoal or sulphur is hardly possible.

When gunpowder is digested with chlorate of potash and dilute muriatic acid, at a moderate heat, in a retort, the sulphur is acidified; but this process is disagreeable and slow, and consumes much chlorate. The resulting sulphuric acid, being tested by nitrate of baryta, indicates, of course, the quantity of sulphur in the gunpowder, A curious fact occurred to me in this experiment :—After the sulphur and charcoal of the gunpowder had been quite acidified, I poured some solution of the baryta salt into the mixture, but no cloud of sulphate ensued. On evapo-

rating to dryness, however, and redissolving, the nitrate of baryta became effective, and enabled me to estimate the sulphuric acid generated, which was, of course, ten for every four of sulphur.

The acidification of the sulphur, by nitric or nitro-muriatic acid, is likewise a slow and unpleasant operation.

By digesting gunpowder with potash water, so as to convert its sulphur into a sulphuret, mixing this with nitre in great excess, drying and igniting, I had hoped to convert the sulphur readily into sulphuric acid; but on treating the fused mass with dilute nitric acid, more or less *sulphurous* acid was exhaled; this occurred, even though chlorate of potash had been mixed with the nitre to aid the oxigenation.

The following are the results of my analysis, conducted by the first described method :—

100 grains afford, of	Nitre.	Charcoal.	Sulphur.	Water.	
Waltham Abbey	74.5	14.4	10.0	1.1	
Hall, Dartford	76.2	14.0	9.0	0.5	loss 0.3
Pigou and Wilks	77.4	13.5	8.5	0.6	
Curtis and Harvey ..	76.7	12.5	9.0	1.1	loss 0.7
Battle gunpowder ..	77.0	13.5	8.0	0.8	loss 0.7

It is probable, for reasons already assigned, that the proportions mixed by the manufacturers may differ slightly from the above.

The English sporting gunpowders have long been an object of desire and emulation in France: their great superiority for fowling pieces, over the product of the French national manufactories, is indisputable: unwilling to ascribe this superiority to any genuine cause, M. Vergnaud, Captain of French artillery, in a little work on fulminating powders, lately published, asserts *positively*, that the English manufacturers of "poudre de chasse" are guilty of the "charlatanisme" of mixing fulminating mercury with it. To determine what truth was in this allegation, with regard at least to the above five celebrated gunpowders, I made the following experiments :—

One grain of fulminating mercury, in crystalline particles, was mixed in water with 200 grains of the Waltham Abbey gunpowder, and the mixture was digested over a lamp, with a very little muriatic acid. The filtered liquid gave manifest indications of the corrosive sublimate, into which fulminating mercury is instantly convertible by muriatic acid, for copper was quicksilvered by it—potash caused a white cloud in it, that became yellow, and sulphuretted hydrogen gas separated a dirty yellow-white precipitate of bisulphuret of mercury. When the Waltham Abbey powder was treated alone with dilute muriatic acid, no effect whatever was produced on the filtered liquid by the sulphuretted hydrogen gas.

Two hundred grains of each of the above sporting gunpowders

were treated precisely in the same way, but no trace of mercury was obtained by the severest tests. Since, by this process, there is no doubt but one 10,000th part of fulminating mercury could be detected, we may conclude, that Captain Vergnaud's charge is groundless. The superiority of our sporting gunpowders is due to the same cause as the superiority of our cotton fabrics; the care of our manufacturers in selecting the best materials, and their skill in combining them.

[*Detonating Matches in our next.*]

THE SOCIETY FOR THE ENCOURAGEMENT OF ARTS.

We had occasion in a former number, (No. 74, vol. iv, N. S.) to notice the disingenuous and illiberal manner in which the "Society for the *encouragement!* of Arts" treated Mr. J. Barton, whose patent expanding piston is decidedly the most perfect invention of the kind now in use: we then animadverted with severity, but not with more severity than justice, on the ignorance or prejudice of the Society, in giving a reward for an inferior invention, and condemning in the same breath, a superior one, when they ought to have known, that Mr. Barton's piston had the advantage both in originality and merit. From the last volume of the Society's Transactions, just published, it appears that Mr. Barton has, very properly, required that an investigation on the subject should take place; in the course of which he produced the most satisfactory proof of the mistake (to say the least of it) into which the society had fallen; and they have consequently, been compelled to make the *amende honorable*, or, in plain speaking, to eat their own words. We are sorry to see a society, which, we confess, in its time has done some service, placed in this humiliating condition, for the same reason that we should pity and regret the incapacity and blunders of superannuated age. It is a truth, which we are reluctant to record, that the society is rapidly declining in public estimation; partly from its own proceedings, and partly because its utility has been superseded by other institutions more conformable to the spirit and progress of the times. In proof of its decaying reputation, it may be remarked that the Annual Report of its Transactions used to occupy a good sized octavo volume, superbly and extensively embellished, while the Reports of the Transactions for the recent years are comprised in very moderate sized pamphlets, while the notices of inventions and discoveries (when original) are, for the most part, of a trifling and unimportant nature! Yet, we are convinced that, under able direction, and by adhering to a line of strict justice and impartiality, by distributing rewards only to merit and not from favouritism, the society might still have maintained a respectable character, if it did not stand at the head of the various ex-

cellent institutions, for the same object, newly grown up in the metropolis. We wish most sincerely, that we could anticipate its renovation, but so long as the present antiquated and *select* system prevails in its management, we fear there is no chance of any such desirable event.

Upon the subject of the foregoing remarks we have received the following letter from Mr. Barton; who has a right to be heard upon a matter so immediately concerning himself:—

To the Editor of the Register of Arts and Journal of Patent Inventions.

No 6, *Goswell Road,*
Jan. 19*th*, 1831.

Sir,—The *Society of Arts* having complied with my wish for an investigation of the charge they so unwarrantably brought against my metallic expanding piston; they have in their last volume of Transactions made me some, though inadequate, atonement for the injury done by them to my feelings and interests. Indeed, in the latter point I know not how much I may have suffered by the impression produced by the Society's remarks on this subject, in the interval (eighteen months) between the charge and its refutation.

The charge made against my patent metallic piston by the Society was, that it "scored and destroyed the cylinder." An investigation of so serious an accusation was, of course, required by me, and, as it could not be with any decency refused, it was conceded. It accordingly took place in the Society's rooms, before the joint committees of mechanics and correspondence and papers, and occupied three hours.

The committee did not bring forward a single instance in support of their allegation; but it appeared that the effects they had so rashly attributed to my piston had been produced—by what? Why, by some of the many imitations by which my patent has been infringed. On the other hand, the investigation fully and completely confirmed, the utility and superiority of my invention above all others of the same kind hitherto known.

In the course of the inquiry I produced, as you will perceive by the annexed extract, several gentlemen of high respectability and of acknowledged eminence in their profession—the most distinguished engineers of the day—whose testimony was in the highest degree flattering in proof of the successful operation of my invention.

The following extract from the last volume of the Society's Transactions, gives the result of their investigation.

"In the 46th vol. p. 64, is the description of a metallic expanding piston, by Mr. Robert Mottershead; and in the introductory remarks it is stated that one of the best patent expanding

pistons 'has been found very liable to mark, and finally to score and destroy the cylinder, against the sides of which it is continually pressing, &c." Mr. J. Barton, conceiving that his patent expanding piston is the one referred to in the above sentence (and indeed the description which immediately precedes the clause complained of hardly suits any other), has addressed a letter to the Society, requesting that he may be allowed to produce evidence that the remark is founded in mistake, as otherwise his interest may be affected by a charge which, although made inadvertently and incidentally, and without mention of Mr. Barton's name, will be considered by many persons as coming with authority, from its appearance in the Society's Transactions. The request was immediately acceded to, and the matter was referred for investigation, during the Society's vacation, to the Committee of Correspondence and Papers, in order that some notice of it might be inserted, if requisite, in the forthcoming volume of "Transactions." Mr. Barton, accordingly, produced very satisfactory testimony from Mr. Brunel, Mr. J. I. Hawkins, Mr. J. Martineau, Mr. Rastric, and other engineers, showing that his patent expanding piston has been employed by them in steam-engines of high and low pressure for various times, up to two years or more, not only without doing the least injury to the cylinders, but improving them by the high polish which they acquire from it after a few months' wear."

Having wrung this tardy justice from the Society, I will merely observe, that every mechanic and scientific man must lament, that an institution designed to foster, encourage, and promote ingenuity, inventions, improvements and discoveries, in the useful arts and sciences, should have been, for several years past, so mis-managed as to have fallen into general disrepute, if not odium, among those who have felt any interest in its proceedings. If the many honourable and liberal persons by whose subscriptions and donations the Society is supported were aware of the manner in which its funds are too often applied, they would hesitate to continue any longer their contributions. It is time that the majority of disinterested patrons of the Society should take a more active part than they do in its affairs, and wrest the management from the hands of the few *select* individuals who at present govern its concerns, if they wish to rescue it from obloquy, and reinstate it in its former prosperity and usefulness.

I have the honour to be, Sir,

Your obedient humble Servant,

JOHN BARTON.

P. S.—An attempt has just been made, through the Country and London newspapers, to assign the merit of my invention to Mr. M' Dowall, of Johnstone, who was sometime since employed by me; but the clumsy effort has, I suspect, by this time recoiled upon himself, and I feel little doubt that ultimately he will have

to regret either his own vanity and indiscretion, or to exclaim "protect me from my friends—I can defend myself against my enemies!"

I have also to complaint of similar injustice on the part of Mr. Peter A. Brown, solicitor, of Philadelphia, who was introduced to me by Mr. Mortimer, the Gun-smith, of Regent Street, London, at the time I was engaged in taking out my English patent for my metallic pistons; when Mr. Brown requested I would defer the publication of my invention, until he could get home to America, where he would patent the invention, and account to me for half the profits resulting from it. That *gentleman*, however, thought proper to retain not only *all* the profits arising from the American patent, but to claim for himself, wholly and exclusively, whatever merit may belong to the invention! To prevent the possibility of error, I made him a model of the piston, which he took with him to America. Mr. Mortimer is a witness to these facts.—J. B.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a Patent for an improvement in the making or manufacturing of raw or brown Sugar, from the Cane Juice, or from the sirup made therefrom. Granted to Wm. A. Archbald, *Sugar Refiner, of the City of New York, April* 19, 1830.

This improvement consists in concentrating, or converting the said cane juice into sirup, or sugar, in wooden vessels; which wooden vessels may be made of any convenient shape or size; in preference made of well seasoned white pine, fitted up and arranged in the interior with a copper pipe of a dimension suited to the size of the vessel which may be deemed convenient for the operation; or with a copper or other metallic vessel in the form of a globe, or in any other form calculated to receive and retain steam, and impart the heat thereof to the juice, or liquid, by which it is enveloped. But I do use in preference wooden vessels in the form of tubs, or tanks, of a round shape, hooped with iron, fitted in the interior with one or more rows of copper pipe placed horizontally, either lying close together, or at a small distance from each other, which pipe I do bend in a circular form so as to occupy and fill up the whole of the interior surface of the bottom of the tub, except a small space in the centre, in which space I do fix a valve with a rod attached thereto, for the purpose of drawing off, or allowing the liquid to escape. This pipe is connected with the steam generator, and fitted with cocks to allow the steam being let on to boil the juice or liquid, and stopt at pleasure; which any engineer, or coppersmith, can arrange.

Now for the purpose of boiling or concentrating the cane juice into sirup, or sugar, I do use three or more of these wooden vessels, or tubs, placed one above the other, on wooden frames, so as to

admit of the liquid being conveniently and freely drawn by a cock, or valve, into the lower one, which I do use as a concentrator, the others operating as evaporators. And I do by preference arrange the pipes of the aforesaid concentrator, so that both rows are close together, lying upon the bottom of the tub; while those of the evaporators are raised six or eight inches above the lower one, in order more equally to distribute the heat of the steam, in the liquid; the lower end of this pipe I do pass through the bottom or side of the tub, so fixed as to prevent leakage at the hole through which it passes, at the outer end of which pipe, in each tub, I do fix a cock to allow the condensed steam to escape; and I do declare that in order to boil with economy and advantage, I do make use of the same steam that is employed to work the engine, that is to say, I do use steam generated by the same fire that is employed to produce steam for the engine, although steam generated in any way would answer. The aforesaid tubs may be arranged and placed in any way most convenient for operating; and the steam should be of a high temperature, such as is produced from steam of 40 or 50 lbs. to the inch, or upwards; the higher the temperature the more rapid the operation, and the better the effect upon the sugar.

In order to supply the tubs with juice, I do conduct it from the receiver by means of a wooden or other spout; the juice being converted into sugar, is drawn off into a cooler, and then transferred to moulds or hogsheads.

I now proceed to state the advantages to be derived from boiling the cane juice in wooden vessels, instead of as is now done, in those of metal; and these advantages are, *first*, the cheapness with which they can be made, and the ease and economy with which they can be arranged and set. *Secondly*, their great superiority over metallic vessels in retaining heat, causing a considerable saving of fuel, and the rapidity of boiling resulting from wood being a non-conductor of heat, consequently not allowing any portion of the heat imparted to the liquid from the steam to escape, but confining the whole of such heat to the liquid. *Thirdly*, the absolute impossibility of burning the sugar, which by the ordinary mode of boiling almost invariably occurs, from the heat of the vessel. *Fourthly*, their seldom or never wanting to be renewed, and hardly ever needing to be cleaned: whereas the vessels now used, not only require to be frequently cleaned, at great trouble and loss of time, but often crack or break, by which the planter is retarded in his operations, and suffers great loss.

I claim under these my letters patent, an exclusive privilege in my improvement, which consists in boiling cane juice into sirup, or sugar, in wooden vessels. WM. A. ARCHBALD.

AA, Fig. 2, Pl. XVIII. receivers for the juice from the mill, serving as clarifyers.

B B, copper pipe for heating the juice.

C, general steam conductor leading from the steam boiler.

D D, spouts to lead the juice from the clarifyer to the evaporators.

E, evaporator.

F, cock connected with the worm in one of the evaporators.

G, concentrator.

H H, cocks connected with the pipe of the clarifyers.

I, cock to draw the juice from the evaporator to the concentrator. The evaporators may be multiplied to any convenient number.

Note—The pipe in the clarifyers may be perforated with small holes, but it would be preferable to lead the condensed water off by a cock, instead of perforating the pipe.

Specification of a patent for an improvement in the mode of preparing Paddy or rough Rice, suitable for culinary purposes. Granted to John L. Norton, *of the City of New York, at present residing in Charleston. South Carolina, May 7th,* 1830.

The paddy or rough rice, after having been sifted through a screen of wire cloth to separate it from the defective light rice and dust, or sand, descends, or is conveyed to a pair of mill stones, for the purpose of shelling or removing the external hull or shell; from the stone the rice passes a wind fan, to separate the chaff, or outer husk, from the shelled rice, which is next to be conveyed to a screen of wire cloth, of two degrees of fineness, the finest part being at the most elevated end is adapted to let out the dust or sand, and the lower or coarser part, to allow the shelled rice to pass through; and such grains as may have escaped from the stones without being shelled. will not pass through this wire cloth, but be delivered at its lower end to be passed again to the stones. The process so far described, has been known and used for a long period of time, and I distinctly disclaim all exclusive privilege to the use of any part, or parts of the foregoing process.

But rice has also an internal pellicle or skin, which, although very thin, requires to be removed before it is fit for culinary use, and which is not effected by the previous operation of the stones or screens. The following is a full and exact description of my improvement.

The internal pellicle or skin, I rub off, and remove by triturating, or rubbing the shelled rice between a mill stone, commonly called the bed stone, and a runner (made of wood, or other substance), faced with sheep-skin, (with the wool on) or any other elastic substance, which presses the rice close against the bed stone, not so hard as to break the rice, but sufficiently so to cause the grain to be rubbed with a rapid motion against the stone, which takes off the extraneous substance from most of the grains, leaving the pearly substance of the grain bright and clear; this process is to be repeated, and the quality or state of the rice may be such, as to require it to be passed through the machine three or more times, and to be screened and fanned between each operation. The rice is then, in the ordinary manner, to pass through screens or fans, to the spout which delivers it into the barrel.

The application of this invention may be varied by making the

runners of stone, and the bed stone (if I may so call it) of wood or other substance, faced with sheep skin (with the wool on) or any other elastic substance, which will press, and keep the rice in close contact with the stone.

The bed stone and runner which I have used, are six feet in diameter, and move at the rate of 120 revolutions per minute, though I do not limit myself to any particular dimensions or speed, but I have found these to answer my purpose. JOHN L. NORTON.

MISCELLANEOUS.

SIZE FOR ARTISTS' ILLUMINATORS.—Four ounces of Flanders' glue, and four ounces of white soap are to be dissolved on the fire in a pint of water, two ounces of powdered alum added. The whole stirred and left to cool. It is to be spread cold with a sponge or pencil, on the paper to be prepared; and is much used by those who have to colour unsized paper, as artists, typographers, &c.—*Bull. Univ.* xiv. 344.

PREPARATION OF PHOSPHURET OF LIME.—Dr. Coxe says he employs two Hessian crucibles, some of the inner members of a nest. The larger of the two has a hole bored through its bottom, and a test tube of a suitable size luted in with clay. The phosphurus is put into the test tube, the top of which is loosely covered with a piece of broken crucible, to prevent the small pieces of quick lime from running down into it. The lime is then put in so as to fill this crucible and partly fill the upper small one, which serves as a cover to it, and is luted on with some fine clay a little moistened. The cover has also a small hole in its top to afford an outlet for the air, or volatilized phosphurus, if there should be any occasion for it. The whole is now placed upon the grate of a furnace, with the test tube projecting through and appearing below, and a charcoal fire kindled around it. The phosphurus may be kept cool if it should be thought necessary, by making the tube dip into the water contained in a tin cup attached to the end of a stick. When the crucibles and their contents are thoroughly red hot, a chafing dish is substituted for the tin cup, and the phosphurus rising in vapour produces the desired change. The phosphurus should be preserved in a seal phial. The same crucible may be used a number of times.—*Siliman's Journal.*

REPRODUCTION OF BUDS.—Mr. Knight observes that every tree, in the ordinary course of its growth, generates in each season those buds which expand in the succeeding spring, and the buds thus generated contain, in many instances, the whole leaves which appear in the following summer. But if these buds be destroyed in the winter, or early part of the spring, other buds, in many species of trees, are generated, which in every respect perform the office of those which previously existed, except that they never afford fruit or blossoms.

LIST OF NEW PATENTS SEALED.

WOOLLEN CLOTHS.—To Daniel Papps, of Stanley End, Machine Maker, for improvements in machinery for dressing or roughing woollen cloths.—Dated December 23, 1830.—Specification to be enrolled in two months.

COAL MINES.—To W. Wood, of Summer Hill, Northumberland, for the application of a battering ram to the purpose of working coal in mines.—23rd December, 1830. Four months.

SUGAR.—To M. E. A. Pertius, of No. 56, Rue du Bac, Paris, Spinster, for the fabrication or preparation of a coal fitted for refining and purifying sugar, &c.—23rd December, 1830. Six months.

WOOLLEN CLOTHS.—To J. Ferrabee, of the Thrupp Mill and Foundry, in Stroud, Gloucester, Engineer, for improvements in machinery for preparing the pile or face of woollen or other cloths requiring such a process.—23rd December, 1830. Six months.

LACE.—To J. Blackwell and T. Alcock, both of Claines, Worcester, Machine Makers, and Lace or Bobbin-Net Manufacturers, for improvements in machinery for making lace, commonly called bobbin-net.—13th January, 1831. Six months.

STEAM BOILERS.—To Samuel Seward, of the Canal Iron Works, Poplar, Middlesex, Engineer, for improvements in apparatus for economising steam, and for other purposes, and the application thereof to the boilers of steam-engines employed on board packet boats and other vessels.—15th January, 1831. Six months.

CHARCOAL.—To W. Parker, of Albany Street, Regent's Park, Middlesex, Gentleman, for certain improvements in preparing animal charcoal.—15th January, 1831. Four months.

SKATES.—To J. and G. Rodgers, of Sheffield, Yorkshire, Cutlers; and T. Fellows, Jun. of New Cross, Deptford, Kent, Gentleman, for an improved skate.—18th January, 1831. Two months.

PROPELLING.—To A. Smith, of Princes Street, Leicester Square, Middlesex, Engineer, for certain improvements in machinery for propelling boats and other vessels on water, &c.—22nd January, 1831. Six months.

CHRONOMETERS. .To J. G. Ulrich, of Nicholas Lane, London, Chronometer Maker, for certain improvements in chronometers.—22nd Jan. 1831. Eighteen months.

STAMPING.—To C. M. Hannington, of Nelson Square, Surrey, Gentleman, for an improved apparatus for impressing, stamping, or printing, for certain purposes.—22nd January, 1831. Six months.

WEAVING.—To L. Schwabe, of Manchester, Manufacturer, for certain processes and apparatus for preparing, beaming, printing, and weaving yarns of cotton, linen, silk, woollen, and other fibrous substances.—22nd January, 1831. Six months.

TO OUR READERS AND CORRESPONDENTS.

Since receiving Mr. Hynes's letter relating to the Petrisseur, or dough kneading machine, (described in our number for June, page 17) we have ascertained that the patentees had ceased to possess any monopoly in its manufacture or use, having disposed of the patent-right to Henry Philip Hope, Esq. who it appears purchased the patent-right for the purpose of throwing it open to public use. Our ignorance of this remarkable fact will account for our expressions of surprise at what then appeared to be the case; namely, that patentees should immediately after paying a large sum to secure a monopoly of an invention, invite the public to improve that invention, and thereby destroy their monopoly. We have to express our thanks to Mr. Hynes for the trouble he has taken in the explanation of this matter; to whom also the public are indebted for his zealous assistance in seconding the disinterested and generous views of Mr. Hope.

An Old Mechanic's letter, intended for insertion, is unfortunately mislaid.

Mr. Hooper's communication is received, and will be attended to in our next.

PATENTS ENROLLED BETWEEN 10TH JANUARY, 1830, AND 10TH FEBRUARY, 1831.

Particularizing the Offices in which the Specifications may be inspected with the Dates of Enrolment.

PRINTING MACHINES.—To Edward Cowper, of Streatham Place, in the county of Surrey, and Ebenezer Cowper, of Suffolk Street, Pall Mall East, Westminster, Engineers, a patent for "certain improvements on printing machines," was granted on the 19th of July, 1830, and the specification was enrolled in the Enrolment Office on the 19th of January, 1831.

To no man is the public more indebted for improvements in printing machines than Edward Cowper; we have frequently had occasion to notice, in terms of approbation, his ingenious contrivances for the perfection of the printing machines.

The patent before us includes two improvements of much importance; the one applicable to the distribution of the ink on the forms, and the other to the arrangement of the felt or blanket on the cylinder which gives the impression. One of the most important and most difficult of accomplishment in machine printing is the inking of the forms. Mr. Edward Cowper's previous patent for improvements in printing machines included a description of an inking apparatus, the very general adoption of which, sufficiently attests its utility.

It consists of a metal roller, which is made to turn slowly with its surface in contact with a mass of ink, by which a thin film of ink is brought round and deposited upon an elastic composition roller, which is connected by crank levers with an eccentric circle, by which it is made to revolve for a short time with its surface in contact with the ink or ducter roller, and then to descend and rest upon a metallic inking table, which is connected to, and carried backwards and forwards with the form carriage, by which the ink is distributed on the table. The table thus charged with ink passes under three small elastic composition rollers and communicates a supply to their surfaces. These small rollers are mounted in a frame, with liberty to descend upon the table and spread the ink evenly on its surface as it passes under them. And in order to insure the perfect distribution of the ink the elastic rollers have an end motion communicated to them, by moving in an oscillating frame in contact with the sloping sides of the ink table. The ink table next passes under, and communicates ink to four small elastic rollers, which transfer the ink from the table to

types as the form frame passes backwards and forwards under them. We have deemed it necessary thus far to describe Mr. Cowper's first plan of inking that the reader may the better understand the improvements which he now proposes: which consists in the introduction of a travelling elastic composition roller, in connection with the form frame, instead of the ink table, as represented by fig. 3, Plate XX, where *a* represents the type form, *b* a frame carrying the travelling roller *c*, *d* a small roller for spreading the ink on *c*. *e* is a vibrating roller which fetches the ink from the ductor roller *f* and ink trough *g*, and deposits it upon *c*. *h* is a fixed pin, by which the roller *e* is made to vibrate as the form frame is moved backwards and forwards. *i i i* are a set of small rollers which receive the ink from *e* and distribute it upon the types; the pivots of these small rollers turn in vertical slits, so that they may not only rest with their whole weight on the surface of the types, but descend to the roller *e*, which is placed lower than the surface of the types, that the blanket or paper on the pressing cylinder may not be inked in passing to the rollers *i i i*. An end motion is given to the roller *e* by means of two friction rollers pressing against its ends, which are cut obliquely with respect to its axis of motion, but parallely with respect to each other. As the methods of communicating motion to this inking apparatus will vary with the arrangements of the machine to which it is applied, it is unnecessary to prolong this description by showing any of them.

The improvements in blanketing the paper cylinder will be readily understood by reference to fig. 4, Plate XX, in which *a a* shows the cylinder, *b b* the blanket or cloth covering, and *c c* two small rollers on which it is wound and retained, at any required tension by ratchet wheels and clicks. When the blanket becomes inked so as to dirty the paper, or set off, as the printers' phrase is, a clean portion of it may be readily shifted to the working part of the cylinder, by unwinding it from one of the rollers *c* and winding it upon the other. Various modifications of this arrangement are described in the specification, such as having the cloth to extend only half round the cylinder and the rollers *c c* in opposite sides; or by having them placed nearer the circumference or nearer the centre of the cylinder; but the principle of all is the same; and a good principle it unquestionably is.

FERMENTATION—To E. Riley, of Skinner Street, Bishopsgate Street, a patent for "certain improvements in the process

and apparatus for fermenting malt and other liquors," was granted on the 19th of July, 1830, and the specification was enrolled in the Enrolment Office on the 19th of January, 1831.

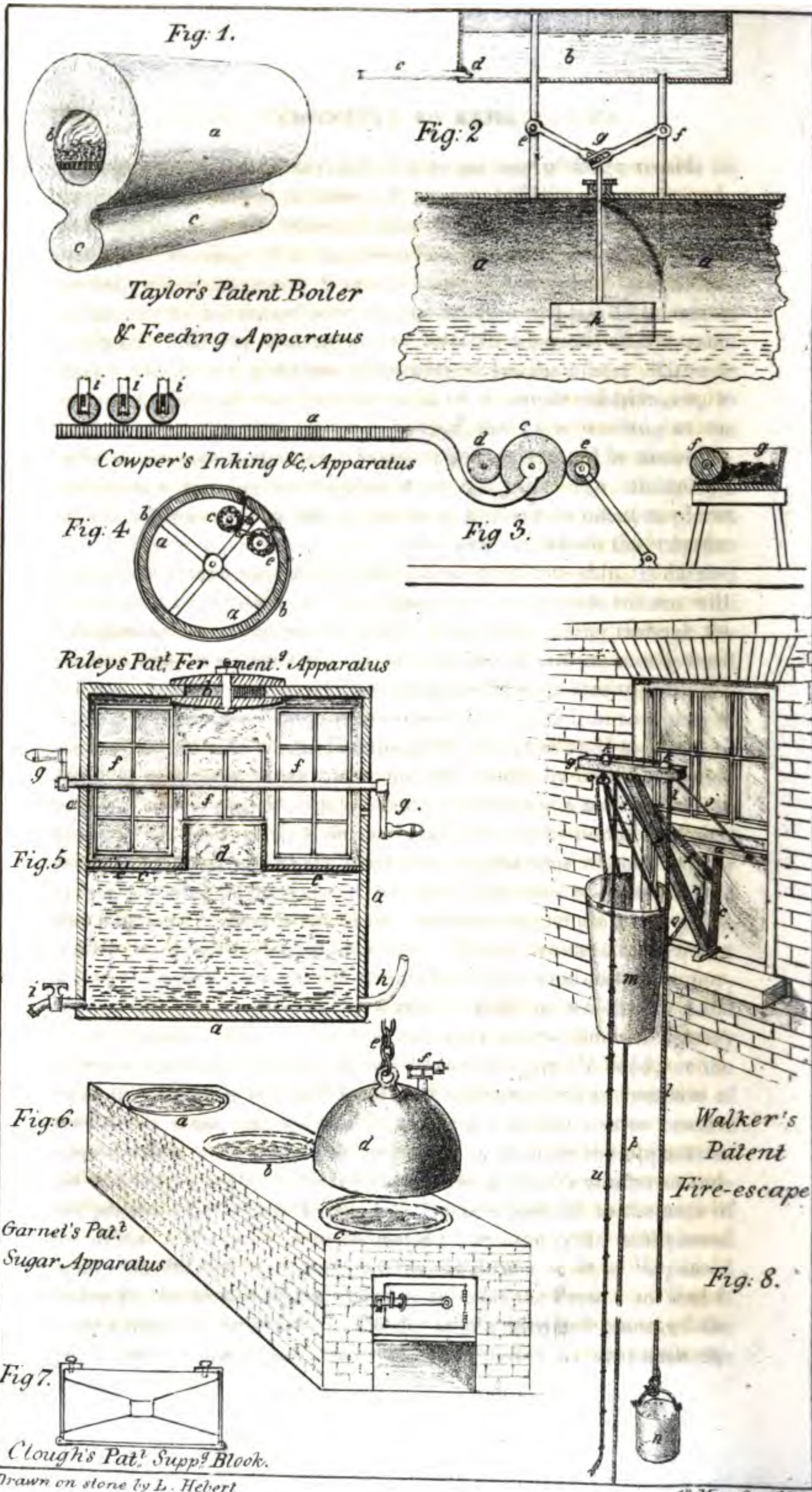
A sketch of Mr. Riley's apparatus for fermenting liquors is given at fig. 5, Plate XX, where *a a* represents the fermenting tub, with an air-tight top *b*, and a horizontal partition or flooring *c*. *d* is a short chimney fixed in the partition *e*, through which the yeast rises in the process of fermentation. *e* is a vale which can be opened at pleasure, to permit liquor to flow from the upper to the lower division of the tub. *f f* are skeleton fans or agitators turning on their axis *g*, which passes through a stuffing box at each end. *h* is a pipe leading to a pump for pumping up liquor from the bottom of the lower division to the upper, and *i* is a cock for drawing off the liquor when the fermentation is completed. There is a man-hole or trap door at *b*, for the supply of ingredients, and for getting in to clean out the apparatus. A piece of strong glass is fitted into the covering of this hole, for the inspection of the process. The lower division being supplied with liquor, and the requisite quantity of yeast supplied to the upper, a small quantity of the liquor is pumped from the bottom of the lower to be mixed with the yeast, and the agitator is put in motion by hand or otherwise, as may best suit the size of the apparatus, or the resources of the operator. The yeast being thus well mixed with a portion of the liquor the mixture is permitted to pass into the lower division through the valve *e*. When the fermenting vessel is large it will be necessary to introduce a row of chimnies similar to *d*, as well as a series of agitating fans, which may be connected so as to be put in action by one application of power.

The tub is surrounded by a jacket or exterior casing, for the purpose of applying hot or cold water to regulate the temperature of the fermenting liquor.

PROPELLING.—To Thomas Bulkeley, of Albany Street, Regent's Park, in the county of Middlesex, M. D. a patent for "certain improvements in propelling vessels, which improvements are also applicable to other purposes," was granted on the 19th of July, 1830, and the specification was enrolled in the Enrolment Office, on the 19th of January, 1831.

It has frequently been found a desideratum that no simple plan of applying manual or other power, to propel sailing vessels when the sails are rendered useless by calms or otherwise: and there have been several plans proposed for the purpose of occasionally

applying the power of steam to the propelling of large vessels on long voyages. Some of these we have at different times noticed; that patented by Mr. Meville, and described in the Register of Arts, vol. iii. page 241, second series, where a set of ducks-foot propellers are projected from the stern of the vessel, and so arranged as to be detached when not in use, appears to be one of the best. But the patent before us also possesses considerable merit, though of a different character from the other. Here is proposed, through the medium of a very simple contrivance, to render manual power, or the power of the crew working at the capstan, in obtaining a slow motion when such would be desirable, and cannot be obtained by the wind and sails. Dr. Bulkeley's paddle wheels are so arranged too that they can be taken to pieces and detached when not in use. The axis on which the capstan turns, when used for the ordinary purposes of the ship, is carried down through the deck into the lower deck, and made to turn with the capstan at pleasure, by means of a bolt passing through the capstan and axis together; on this prolonged capstan axis is fixed a drum, round which an endless chain or band passes to actuate a pair of spur wheels, which communicate rapid motion to a pair of pinions on the axis of the paddle wheels. This endless chain or band is preserved in its place on the drums by means of guide pulleys; and a pulley with a pendant weight is also applied, to preserve an equal tension on the band. It will be perceived, that the axis of the drum which is attached to the spur wheels, will be at right angles to the axis of the drum on the prolonged axis of the capstan; hence it becomes necessary to employ the guide pulleys to prevent the rubbing of the chain or band consequent on its twisting to change the direction of the motion. The portion of the circumference of a small drum on which the band usually applies, is so limited that much tension becomes necessary to prevent the drum from turning without moving the band, or the band from moving without turning the drum: and as increase of tension increases the friction on the pivots so much as to cause a considerable waste of power employed in turning the apparatus. To remedy this, Dr. Bulkeley introduces a small cylinder or pulley placed close to the drum, with its axis parallel to the axis of the drum. The band is to be carried over the drum and passed under this friction cylinder, and in its return it is to be passed under the friction cylinder and carried over the drum; so that it is thus made to embrace nearly the whole circumference of the drum, and requires but little waste of power to overcome the friction.



Drawn on stone by L. Hebert *1st March 1831.*

Having now given an idea of the method of communicating motion to the axis of the paddle wheels, we shall describe the construction of these wheels, and the manner of detaching them when not in use. On the exterior end of the axis which passes through the side of the ship, is fixed a nave, made very strong, and secured with iron plates at each end bolted together. In this nave are mortices for the ends of eight spokes. To each two of the spokes is attached a quarter of the periphery of the paddle wheel, which are made to lap over each other, and firmly connected by screwed bolts. After inserting two of the spokes and a quarter of the periphery, the axis is turned a quarter of a revolution, and a second pair of spokes and portion of the periphery are introduced and bolted to the first; and this is repeated till the wheel is completed.

The paddles or float-boards are fixed upon stems which pass through the periphery, that they may be secured in their places by screwed nuts, with their outer edges projecting alternately from the nave and from the side of the vessel; so that half the paddles project from the face of the wheel.

STEAM BOILERS.—To William Taylor, of Wednesbury, in the county of Stafford, Engineer, a patent "for certain improvements on boilers and apparatus connected therewith, applicable to steam engines and other purposes," was granted on the 19th of July, 1830, and the specification was enrolled in the Enrolment Office on the 19th of January, 1831.

In this specification there are described improvements connected with steam boilers. The first is a method of feeding or supplying the boiler with water, represented by the diagram fig. 2, Pl. XX., where *a* shows a portion of the boiler, *b* a water reservoir or feeding vessel, made steam tight; *e* a pipe through which *b* is supplied with water, having a valve *d* opening inwards. *e* is a steam pipe extending from the boiler to nearly the top of the close vessel *b*, and *c* is a water pipe extending from the bottom of the close vessel to the interior of the boiler. In both these pipes are stop cocks *e* and *f*, with levers extending to *g*, by which they are opened and closed. In these levers are two longitudinal slits for the reception of a pin fixed in a rod extending from the float *h*, through a stuffing box in the top of the boiler. Now, when the water in the boiler evaporates till its surface descends and permits the weight of the float to bring down the levers to the position represented, the cocks will be opened and the steam will

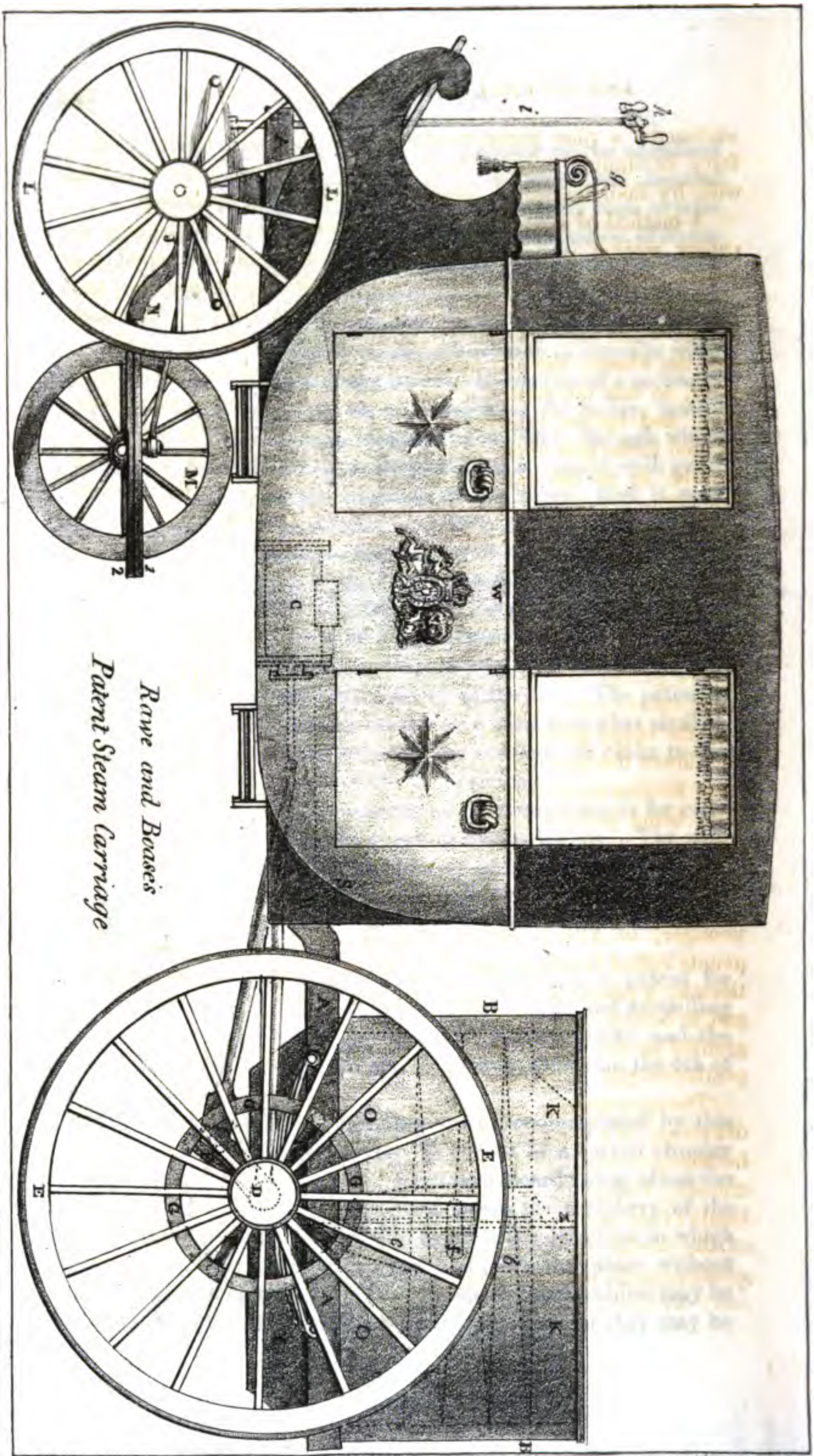
rise through the pipe *e*, by which the pressure will be equalized in the boiler *a* and the supply vessel *b*, and water will descend through *f* till its surface in the boiler rises sufficiently high to raise the float and shut the valves: and then the condensation of steam in *b* will cause a partial vacuum, permitting a fresh dose of water to pass through *c* into the feed vessel.

Mr. Taylor's second improvement has for its object the cleaning of sediments, so as to prevent the incrustation of deposits without stopping the operation of the boiler. It consists of a sediment trough or vessel extending all the length of the boiler, immediately under it, with a valve opening at one end, through which a portion of water is occasionally permitted to escape with great velocity; arising from the pressure of the steam, that it may carry with it whatever deposit may have lodged in the bottom. Fig. 1, Pl. XX. represents this arrangement, where *a* shows a boiler of the Trivethick kind, having the fire *b* within it, and *c* shows the deposit vessel situated below the fire. When this invention is applied to boilers which have the fire under, instead of within them, there must be a deposit trough on each side, and these must be protected from the action of the fire. The patentee seems fully aware that deposit vessels on a plan somewhat similar, have been before tried, and therefore, he confines his claim to the particular modification of it which he describes.

The third improvement consists of two contrivances for consuming the smoke from the furnaces of steam boilers. The one, is to draw the smoke from the chimney and drive it through the fire again by a blowing machine; and the other, is by making it return and pass through a series of red hot tubes within the fire.

Propelling.—To J. Ruthven, of Edinburgh, a patent for "improved machinery for the navigating of vessels and propelling of carriages," was granted on the 5th of August, 1830, and the specification was enrolled in the Enrolment Office on the 5th of February, 1831.

The improvements in propelling vessels contemplated by this patentee may be described shortly, to consist of a curved circular form given to the float-boards. Each float-board being about the sixth part of a hollow cylinder fixed across the periphery of the paddle wheel, with its convex side towards the direction in which it moves, so that it may both enter and leave the water without producing much agitation. These circular formed paddles may be left entirely open at their ends and concave side, or they may be



Rawe and Boase's
Patent Steam Carriage

Drawn on stone by L. Hebert

1st March 1831.

enclosed; a plan recommended when they are to be used on ferry or similar passage boats, as the enclosed hollow paddles will, by their buoyancy, prevent the boat from upsetting.

A method of converting an alternating into a continuous rotatory motion is next described, to consist of two equal spur wheels, acting on each other with a pair of palls attached to a vibrating lever, and acting on the wheels in different directions, so that which ever way the vibrating lever is pulled the palls will turn the wheels, the one acting on the one and the other on the other, so that the motion of each wheel will be in the same direction; and by the intervention of a pinion the motion is communicated to the axis of the paddle wheels, if employed for propelling vessels, or to the axis of the carriage wheels, if employed for propelling carriages. For the purpose of getting many hands to work at the same time upon this vibrating lever, it is proposed to attach to its top a horizontal beam, with cross bars for the men to work at.

The specification concludes by a description of a method of working ships and other pumps. On each of the piston rods of a pair of pumps placed near each other, are two friction rollers; and a curved arm connected with a vibrating lever is made to pass over the upper pulley and under the lower, and so bent as to raise and lower the rods alternately by the vibrations of the lever; a large friction roller is placed between the piston rods to keep them from being pressed together by the bent arms, and to produc parallelism in their motions.

Locomotive Steam Carriages.—To John Rawe, the younger, of Albany Street, Regent's Park, (being one of the people called Quakers) and John Boase, of the same place, Gentleman, a patent for "certain improvements in steam carriages, and in boilers, and a method of producing increased draft," was granted on the 19th of July, 1830, and the specification was deposited in the Petty Bag Office, on the 19th of January, 1831.

The specification of their patent contains a description, with drawings, of a complete locomotive carriage for the common road, including several novel arrangements in the details of the machinery, besides those to which the patent-right extends. The limits of our work will not permit us to give so minute an account of the whole, as we should be disposed to do, were our space greater, or the various subjects we are bound to notice less numerous; we shall, therefore, proceed to describe *separately*, what we

deem to be the leading improvements introduced by the patentees, and afterwards show them *in combination*, with reference to our own drawing of an elevation of the carriage, which being an *external* view, better suits the comprehension of the popular reader, than the *sectional* representations contained in the patentees' documents; besides, to us, effecting an indispensable saving of room.

The boiler, we are happy to observe, is decidedly original. It is entirely composed of stout wrought iron tubes, having an internal diameter of an inch and three quarters. The length or number of the tubes are, of course, arbitrary, depending upon the capacity of the boiler, (or power of steam required): in the instance before us, the boiler consists of 12 tubes; each individual tube is bent into a spiral figure of three turns, which are of equal diameter or breadth. The first spiral tube thus formed, would contain within its coils a cylinder of 1 foot in diameter: the second spiral tube is curved in a parallel line to the first, but of about 4 inches greater diameter, so that it will lie outside of the first, and exactly circumscribe it, leaving between the two a space of about an eighth of an inch. Each successive tube of the whole twelve, is curved in like manner, the coils of the whole being equidistant; but the diameter of each separate spiral is, in succession, 4 inches greater than the preceding one. By this arrangement, it will be perceived, is produced *a spirally inclined plane of tubes*, which are inclosed in a cylindrical case; at the bottom of this the furnace is situated, about one foot beneath the lowest ends of the tubes, and occupying the whole area of the circle. The upper ends of the range of tubes open into a strong receptacle, and the lower ends of the tubes open into another similar receptacle, being secured in both in a thoroughly steam-tight manner, by means of hollow screwed bolts, with nuts and collars, in the following manner:—A small tube is fixed to the end of each of the spiral tubes, and each of these small tubes is passed through the receptacle, and the shoulders formed by the ends of the large tubes are, with suitable packing interposed, brought, by means of screwed nuts, close up to the side of the receptacles: these receptacles are strong tubes, elliptical in their transverse section and flattened at their conjugate axes, for the convenience of screwing up firmly. For removing the deposit from the water at pleasure, solid plugs are screwed into the ends of the small tubes, which can be taken out whenever required for that purpose.

By the arrangement described it will appear, that the heat from the circular fire, about 4 feet 6 inches in diameter, impinges vertically upon a similar extent of the boiler above; these ascending, the current winds round between the coils of the inclined plane of tubes, which forming the flues as well as the boiler, the heat must be so effectively abstracted in its progress, as to cause a very economical consumption of fuel. We have already mentioned that small spaces, of about an eighth of an inch, are left between the concentric spirals, through these the heated air and flames escape out of the spiral current, and by completely enveloping the tubes, materially augment the production of steam.

To increase the rapidity of the combustion, the current of air through the boiler, is accelerated by means of an exhausting fan wheel placed immediately over the top of the boiler. This is fixed on a vertical spindle which passes through the centre of the boiler of the furnace, underneath which it is connected to suitable gear that is put in motion by a small engine, especially employed for pumping water into the boiler. The flat surfaces of the vanes of the fan wheel are inclined to the plane of their rotation; and instead of the vanes being set radically, as usual, the patentees give them a curvature backwards throughout their length, which causing a less resistance to their motion, permits of a more rapid dispersion of the ascending column of air. In order that no inconvenience may be experienced from the escape of the gaseous products of combustion upwards, the patentees purpose to dispense with the use of a chimney, and by enclosing the upper part of the fan-wheel, and surrounding the boiler with an external casing, cause the vapours to pass downwards against the ground underneath the vehicle.

Although the improved exhausting apparatus described is stated to produce a beneficial effect in exciting the combustion of the fuel, the patentees have invented another means of producing an increased draft, which they deem to be of greater efficacy, and therefore lay an exclusive claim to it. It consists in forcing a mixture of highly rarefied steam and heated air through the ignited fuel in the furnace, by an apparatus of the following description: A pair of double bellows, or other blowing machine, is to be worked by the small steam engine before mentioned, by which atmospheric air is forced along a pipe that makes several coils round the ash-pit before entering a chamber immediately beneath the grate bars. Into this chamber, by another pipe, is also introduced steam; the air and steam therein becoming intimately mixed, they proceed

hence through a series of short vertical tubes into the hollow bars of the grate, and thence through certain perforated nozzles into the fire in minute jets. In the apparatus exhibited in the enrolled drawings, only that portion of the grate bars are hollow, which are the medium of distributing the mixed steam and air into the furnace; the rest of the bars may be hollow or not, as desired. All the bars have, however, the usual space between them for the supply of atmospheric air in the natural or usual way, and independantly of the supply of the artificial mixture of steam and air just described.

Having now explained the arrangements for producing intense combustion, and the characteristic of the boiler, we proceed to notice the mode of regulating the snpply of water to the boiler, and of steam to the engine.

In the centre of the boiler (and occupying the space before mentioned in our description of it) is situated the float chamber; this is of a cylindrical form as far as the boiler extends; but the lower portion, which passes through the furnace and the bottom of the grate, is tapered off to a reduced diameter, making the figure of an inverted frustrum of a cone; to the lower end of this vessel is screwed an iron cap, and the upper end is closed in like manner: passing through both these caps and the middle of the chamber, is a straight piece of tube fixed "stanch" to the caps by screwed nuts and packing. This tube is left open on the outside of the vessel at both ends, and through it passes the vertical spindle of the air-exhausting fan wheel already described; the upper ends carrying the fans, and the lower being connected to the spur gear, through the medium of which the motion of the engine is communicated. By this tubular passage, therefore, the central situation of the float chamber becomes no impediment to the last mentioned operation, and the tube itself serves as a guide for the float as it ascends or descends on the surface of the water. This float is a hollow air-tight copper vessel, of nearly an annular form, having an opening to let the tube pass to its centre, to which it is kept by a vertical rod (fixed to the bottom of the float) that passes through a stuffing box in the lower cap, beyond which it is connected to a lever that operates upon the steam cock of the engine, by which the pump is worked that feeds the supply pipe; thus the float by its rising and falling regulates the supply according to the necessity that may exist. Water being forced by the feed pump into ihe lower receptacle (before mentioned) of the boiler, it flows through apertures in the short tubes into the lower

ends of the spiral tubes, where ebullition takes place, and the water mixed with steam is driven upwards through the spiral tubes; the inclined position of these tubes gives the water a tendency to flow back under the steam; some, however, will be forced on; the quantity of which will decrease as it ascends by being converted into steam: on arriving at the upper receptacle, the steam, together with a small portion of water, enters the float chamber, where the water falls to the bottom and supports the float, while the steam passes into the steam pipe. When a greater quantity of water is accumulated than is evaporated in the float chamber, a rise of the float will be produced, and a proportionate decrease made iu the quantity of water pumped into the boiler; occasioned by the communication, as before described, of the float with the steam cock of the engine. By this arrangement, it will be noticed that the *float chamber* is also a *separatory*, the upper portion constituting a steam reservoir, and the lower portion (the inverted frustrum of a cone) which is in the centre of the fire, serves as a supplementary boiler. The steam pipe commences at the top of the float chamber, and is carried down by the side of and in contact with the inner casing, and also three of four times round the furnace chamber; thus forming a protection to the casing, while the steam derives in consequence, an increase of expansive force.

The whole of the frame and engine is supported upon springs, and to allow of their application to the driving cranked axle, two strong rods are used, each of which is firmly jointed at one end to the frame, and attached at the other end to the cranked axle by bearings, by which the frame is allowed to rise and fall, while derangement thereupon is prevented.

The guiding operation is produced by means of a little wheel running *behind* (but centrally between) the two fore wheels, acted upon by a system of levers moved by the steersmen. The apparatus consists of two rings of iron, of equal diameter, turned truly to each other; to the lower ring is attached by brass bearings, the axle of the guide wheel, and a branch iron proceeds from the front of the upper ring to the axle of the two fore wheels, where it is connected by two joints that allow the guide wheel and its bearing to rise and fall freely, but prevents its side motion without moving the two fore wheels. By turning two handles placed opposite the steersman's seat, a vertical spindle communicates the motion to cross-levers below, which acting upon two rods connected thereto and to the opposite sides of the under hori-

zontal ring, the latter traverses under the upper ring (which has no horizontal motion) and sets the guide wheel to the required angle to the line of motion to make the turn in the road, (precisely in the same manner as setting the rudder at the stern of a boat), the quickness of the turn being in proportion to the angle at which the wheel is set; 45° is as great as ever will be required.

In the drawing of the carriage, represented at Plate XIX, those parts of the machine that are brought into view, when considered in connection with the preceding description, will enable the reader to have a pretty correct notion of the general arrangement. A A show a portion of the iron framing, formed of flat bar-iron placed edgeways, and adapted in its figure to the due fitting of the machinery. B B is the boiler surrounded by its circular double case; C (dotted lines) shows the situation of one of the propelling steam cylinders, (there being one on each side of the carriage) which operates by its piston and connecting rod to the crank axle D; E E is one of the propelling wheels; F F four iron arms or stays, securely keyed to the axle D, and bolted at their extremities to an iron ring G G, which is screwed to the spokes of the propelling wheel, and communicates the rotary motion from the cranked axle; L L one of the fore wheels; M the guide wheel, surrounded by its traversing rings 1 and 2,—1 being attached by the curved arm N to the fore axle, and 2 to the axle of the guide wheel, which is turned to any required position by the levers *h i r*; at *j* there is a spiral spring, inserted between the transit irons of the fore wheels and the bar to which the guide wheel is attached, this spring is acted upon by a screw, to regulate the necessary degree of pressure on the guide wheel, according to the state of the road; the water tank is situated at S. The dotted lines shown upon the boiler are intended to represent the situation of the parts already described;—thus at K K is the exhausting fan-wheel of which *z* is the axis, passing through the tube in the float chamber or separatory *b c*, of which the upper part *b* is the steam reservoir, and the lower part *c* forms a supplementary boiler; *f* is the float resting on the surface, with its rod *d* that acts through another lever upon the steam cock of the engine. At O O is the furnace, and at Y Y the ash pit. At *g* is the seat for the steersman, where a handle is represented for him to regulate the admission of steam to the engines. The various pipes, cocks, valves, and other appendages to the engines being nearly similar to other high pressure engines, we have not thought it necessary to give them a particular description.

Upon a review of the several improvements introduced by Messrs. Rawe and Boase, we think our readers will agree with us, that they have made some important advances towards perfecting the difficult art of travelling by steam upon the common road. The boiler is one of great merit, and calculated, in our opinion, to produce a very powerful effect, in conjunction with the improved exhausting apparatus. The principal features of it are excellent, but we think it might be improved by bringing the lower ends of the spiral tubes and the lower receptacle to the outside of the case, so as to be removed from the direct action of the fire, which will otherwise produce a rapid oxidation of their surfaces, and render a renewal of these parts prematurely necessary. We should like also to see the float or steam chamber divided, or on a reduced scale; the conical form of that part however, which is exposed to the fire, confers upon it great strength, and in the possible case of a rupture there, the effect would only be that of extinguishing the fire. Having no space for further remark, we shall conclude by expressing our admiration generally of the various arrangements of the patentees.

SUGAR MANUFACTURING.—To A. Garnett, of Demerara, Esq. a patent "for certain improvements in manufacturing sugar," was granted on the 24th of July, 1830, and the specification was enrolled in the Enrolment Office on the 24th of January, 1831.

The principal improvement in Mr. Garnett's process, consists in the application of a dome-shaped iron cover, for the teach or concentrating pan suspended over it in such a manner as to be capable of almost instant application and removal, by which the process of supplying and removing the materials is greatly accelerated.

A perspective representation of this apparatus is given at fig. 6, Pl. XX. where *a b* shows a series of clarifying pans, which are to be employed merely in the usual manner; and *c* represents a teach or concentrating pan with a dome-shaped cover *d*, of cast iron, weighing about seven hundred pounds. This cover is suspended over the teach by a chain *e*, which passes over a pulley and round a drum or barrel, with a handle for raising and lowering the cover. *f* is a safety valve, through which the aqueous portion of the syrup escapes in the form of steam through the safety valve. The cane juice having been clarified in the usual manner, is conveyed into the teach and the cover applied; when the boil-

ing or evaporation of the aqueous particles will immediately commence and proceed with great rapidity: so that in the space of five minutes an additional quantity of syrup may be introduced, and in a few minutes more a second supply will be required; and this continued for half an hour, when the teach will require to be employed and the operation recommenced. Therefore, the sugar in the teach may be changed every half-hour: and as no time will be wasted in fitting the cover on the teach, much more work will be effected with the same labour and fuel. When the operation is completed the sugar is to be put into vessels of about six feet long, four feet wide, and two feet deep.

SUGAR.—To M. Robinson, of Great George Street, Westminster, a patent for "certain improvements in the process of making and purifying sugars," was granted on the 5th of August, 1831, and the specification was enrolled in the Enrolment Office on the 5th of February, 1831.

This patentee applies his improvements to the purifying of the cane juice, which is to be extracted in the usual way. He applies to the juice a saturated mixture of alum and lime, in the proportion of two pounds of the mixture to a hundred gallons of the juice. These being intimately mixed, the acid is to be neutralized by the application of milk of lime, in the proportion of three pounds to a hundred gallons. If there be an excess of acid it will be discovered by the application of the test paper usually employed by chemists to detect acids, and more milk of lime must be added: and if there be an excess of alkali, it may be discovered by the application of the test paper used for detecting alkalies, and more juice must be added. When the mixture ceases to effect either the test for acid or alkali, the impurities will be precipitated, and may thus be separated; and the juice thus purified is to be subjected to the usual mode of clarification and concentration; giving preference, however, to Howard's method. And the patentee claims as part of his invention, the application of steam heat to the evaporation of sugar in vacuo: using high pressure steam at about twenty pounds to the square inch.

BREWING AND DISTILLING.—To A. Coffey of the Dock Distillery, Dublin, a patent "for certain improvements in the apparatus or machinery used in the process of brewing and distilling," was granted on the 5th of August, 1830, and the specification was enrolled in the Enrolment Office on the 5th of February, 1831.

Mr. Coffey's improvements in brewing are applicable to the cooling of the wort; which he describes to consist in an apparatus made of two hollow vessels joined together by a series of straight metallic tubes about two feet long and one inch in diameter. These tubes, which are to be made thin, of an appropriate metal, giving the preference to copper tinned, as being a good conductor of caloric, are passed through, and fitted water-tight, into the bottom of the upper vessel; which is left open, and the top of the lower vessel, which is made close, except by the openings through the tubes, and a stop cock by which the liquor is drawn off. These two vessels thus joined together by the straight tubes, are placed in a vessel supplied at its bottom by a pipe descending from an elevation, somewhat higher than its top, with cold water. In the lower of the two vessels joined by the tubes, is introduced, a revolving agitator, which is put in motion by an axis extending down through a large pipe fixed in the centre of the apparatus. The advantage to be derived from the introduction of the straight tubes is, that they may with the greatest facility be kept quite clean: all that is necessary for this purpose being a piece of sponge on a straight rod, which can be used while the apparatus is in operation.

The plan of distillation consists of the following arrangement. From a wash-tub in an elevated situation a pipe descends into a water vessel, where it takes several coils; it then ascends into a vapour vessel; round the interior of which it takes several coils, and then proceeds to the top of a tall rectangular vessel, down which it descends about half-way, in a zigzag direction; it next empties the wash on a shelf, which permits it to descend only on the left side, and the edge of the shelf where the liquid descends is turned down, to prevent the escape of the vapour through the opening when the liquid descends: it then falls upon a second shelf, with an aperture for its descent, and is turned down on the right, and afterwards a third shelf, when it descends on the left again, and so on it passes over a series of shelves. These shelves are furnished with a number of small valves opening upwards, as well as a number of very small holes, without valves, for the passage of steam, which is introduced at the bottom of the apparatus and passes upwards through the valves and small holes, heating wash on the shelves sufficiently to convert the alcohol; and in doing this, the steam becomes condensed, while the alcohol rises up and passes over by a large arched pipe, into the vapour vessel before alluded to, where it communicates heat to the wash as it

passes through the coiled pipe. A thermometer is introduced at the lower part of the wash pipe for showing the temperature; on which are regulating stop cocks for admitting greater or less quantities of steam or wash at pleasure.

WHEELS.—To J. Pearse, of Tavistock, Devon, a patent for "an improved method of making and constructing carriage wheels, and in the application thereof to carriages," was granted on the 5th of August, 1830, and the specification was enrolled in the Enrolment Office on the 5th of February, 1831.

In the second volume of the second series of the *Register of Arts*, we published in April 1828, a description, accompanied by drawings of Mr. Theodore Jones's patent iron suspension wheels, and the patent before us is so similar that we refer the reader to that description in order fully to understand Mr. J. Pearse's patent. Mr. Pearse seems to be aware of the similarity, and confines his claim to the introduction of naves, made of wood, secured by strong hoops and plates of iron. This is certainly no improvement on Mr. Jones's plan for the small nuts, and they must necessarily be small, there being no room for large ones, by which the iron rods constituting the spokes are tightened and secured to the nave, acting on the wood will very soon destroy its fibre, and the spokes thus become loosened and useless.

Mr. Pearse's method of manufacturing axletrees is somewhat different from that usually adopted. He proposes to make that part of the axle on which the body of the carriage rests no longer than the width of the carriage, with a cylindrical hole in each end, extending far enough to receive and hold firmly the end of a cylindrical axis, on which the wheel turns. This cylindrical axis has, on its exterior end, a projecting flanch, which prevents the wheel from coming off when it is passed through from the outside of the wheel and secured in the cylindrical holes in the body of the axle. A longitudinal slit is made on the lower side of the end piece, and a projecting pin in the hole to fit the slit, to secure the introduction of the end piece with the same side upwards. It is then to be secured in its place by a small screw descending from the upper side into it. A conical ring, which corresponds with a recess in the back end of the nave, is then to be firmly fixed on the axis, to keep the wheel in its place, by keeping the outer end of the nave against the projection on the exterior end of the axis on which it turns.

Wheel Barrows.—To W. Mallet, of Malborough Street, Dublin, for "certain improvements in making or constructing certain description of wheel barrows" was granted on the 5th of August, 1830, and the specification was enrolled in the Enrolment Office on the 5th of February, 1831.

Mr. Mallet proposes to make his wheel-barrows entirely of wrought-iron. For the pan or body of the barrow is taken a sheet of wrought-iron, of dimensions corresponding with the purpose for which the barrow is intended ; the gardener requiring a larger and deeper barrow than the road maker or excavator. A shears cut is made at each corner of the sheet to the extent of the intended depth of the sides : it is then to be placed on appropriate blocks and stamped by the descent of a heavy weight or otherwise, into the required form.

The edges of the iron at the corners will lap over each other, giving increased strength where the principal strength is required. The side rails and legs of the barrow are made of angle iron, and they are attached to the body and to each other, by screwed bolts, and strengthened by diagonal stays at the head of the barrow. The wheel is made of a flat ring of considerable strength, with two cross-arms constituting four spokes, with pivots at their ends passing through and riveted to the ring. A hole is made through the middle, where the arms cross each other, to admit the axis, on the middle of which the wheel is firmly secured by a plate, or large screwed nut, on each side. The ends of the axis turn in two bearing blocks attached to the extremities of the side rails. These barrows are said to be much lighter and cheaper than the iron barrows usually made.

Packing and Transporting.—To Sir C. Webb Dance, of Hertsbourne, a patent "for certain improvements in packing and transporting goods," was granted on the 5th of August, 1830, and the specification was enrolled in the Enrolment Office on the 5th of February, 1831.

This patentee's principal object is to facilitate the removal of goods from one vehicle of conveyance to another ; such as from a boat or barge to a waggon or rail-road carriage. With this view he proposes to pack and secure the goods on a kind of platform, which can be with them removed from one mode of conveyance to another. This platform, which is to be made in any manner, or of any suitable material, is, with its load, to be raised and removed by a swing crane, or placed for conveyance on a low

waggon, or itself furnished with wheels on which it can be moved.

When the platform is to be moved on its own wheels, it is to br raised by the crane being hooked to two pivots on opposite sides, placed near the centre of gravity of the mast; so that its position can, when supported by these, be easily reversed and placed in the barge or waggon with its wheels upwards: but this ingenious knight says, he *can* construct his platforms in so many different ways, and of such a variety of different materials, and his modes of moving it are likewise so numerous, that it is very difficult to say what he claims, and still more difficult to discern what he has invented. He tells us, in conclusion, however, that he *can* apply the loco-motive steam engine which may be on board the boat or on the railway carriage, in working the crane.

SUPPORTING BLOCK.—To R. Clough, of Liverpool, a patent "for an improved supporting block, to be used in graving docks, and for other purposes," was granted on the 5th of August, 1830, and the specification was enrolled in the Enrolment Office on the 5th of Eebruary, 1831.

The usual temporary supporting blocks for great weights are made of two equal rectangular wedges, placed the one over the other, with their points in contrary directions. To a supporting block thus constructed, there is a well-grounded objection, in as much as it is difficult to remove when not required, owing to the friction of the surface of the upper wedge against the surface of the weight, and the friction of the lower wedge against the surface on which it rests. To remedy this, Mr. Clough proposes to make his supporting blocks of four pieces, as represented by fig. 7, Pl. XX. the top and bottom pieces being bevilled off at their extremities to receive the smaller ends of two isoscelles wedges. By this simple arrangement is obtained smooth and uniform surfaces for the wedges to act against when they are to be withdrawn. At each end of these supporting blocks there is an iron rod hooked to the bottom of the lower, and secured by a screw at the top of the upper piece, to prevent the wedge or middle piece from receding until it is intended to be removed, when the end rods are unscrewed at the top and folded back, when a blow on the side of the middle piece will start it, and the whole will be instantly released.

Fire Escape.—To Lieut. Col. L. Walker, C. B., of Cumming Street, Pentonville, a patent was granted on the 6th of October 1830, for "a machine or apparatus to effect the escape and preservation of persons and property in case of fire, or other circumstances," the specification of which was enrolled in the Petty Bag Office on the 6th of February, 1831.

This apparatus is explained in the specification by reference to plans, elevations, and sections, but we have thrown the machine into perspective, to give all that is necessary at one view, and to save space in our work. The object of the invention is plainly expressed in the title, we have therefore only to explain the form of its construction and the mode of using it, which we shall do, together with reference to our sketch, fig. 8, Plate XX, where *a* shows a cross-bar or T frame, which is to be placed across the window in the inside of it, and deposited in grooves made for the purpose, the first of the standard c being shod with iron, and resting on the window cill. The machine will thus be firmly supported upon three points of bearing, and the jib *f e* be extended outside from the window. The extremity of the jib carries another cross bar *g*, mounted with two pullies *k k*, round which passes a long rope *l*; to one end of this rope is attached a small bucket, to contain weights, suitably formed and acting as a counter balance; this is first lowered to the ground, the car is next hooked on to the other end of the rope *l*, and drawn close to the window or wall by a short rope Q, and secured to a cleat *r* in the upright post, which will prevent the car swinging outwards whilst a person is getting into it. The person in descending should now take hold of a knotted check-rope *u*, and unloosening the cord Q, let himself or herself down, as slowly or swiftly as he or she pleases. The check-rope being separate and unconnected with the pulley rope, it will, on being pulled, counteract the descent in proportion to the weight then transferred to the check-rope from the person in the car. On reaching the ground the rope *u* should be let go, taking care however that the rope *p*, fixed at the bottom of the car, should be previously laid hold of, in order to prevent the too rapid descent of the counterbalance, and the consequent re-ascent of the car: this rope *p* being also thrown outwards previous to the descent of the car, may be taken hold of by any person on the ground, who may thus be enabled to clear the car from touching any balcony or exterior projection, should any occur. Four and a half stone weight in the counterbalance is appropriate for the descent of persons weighing from six to eleven stone.

On Detonating Matches. By. Dr. Ure.

Continued from page 281.

This subject has been so ably treated in the report of M. M. Aubert, Pellissier, and Gay Lusac, that I shall confine myself to a few observations, the results chiefly of my own experience.

Mr. Howard's proportions of the ingredients for preparing his fulminate of mercury are—

Mercury	100 grains.
Nitric acid, sp. gr. 1.3, 1½ measured ounces..	= 884
Strong alchol, 2 measured ounces	= 750

The mercury is dissolved by heat in the acid—the solution is allowed to cool to a blood-heat, and then poured into the alcohol. On heating the mixture slightly, an effervescence soon ensues, the commencement of which is the signal for removing the heat from the matrass or retort; for if it be continued for some time longer, the chemical action will become furious, and the fulminate will be injured by an admixture of subnitrate of mercury. After the crystalline powder precipitates, the whole is to be thrown on a filter, washed, and dried on a steam-bath.

The authors of the above report say, the best proportions are those of Howard, but they appear to estimate them incorrectly, for they prescribe twelve of nitric acid and twelve of alcohol (by weight) to one of mercury; we may hence infer, that considerable latitude may be used in the proportion of the materials. I consider the latter ones wasteful, since 100 of mercury, with 950 of nitric acid, 1.35 and 850 alcohol 0.835, produce about 120 parts of a perfect fulminate. The supernatent liquid retains nearly five per cent. of the mercury, for five grains of a dark-grey oxide may be obtained from it by ammonia.

I have analyzed the match-powder collected from fifty detonating caps of French manufacture, taken from a stock found to answer very well in practice. The whole weighed exactly 16.3 grains, being about one-third of a grain per cap. Treated with hot water, it yielded 8.5 grains of soluble matter, of which 7.0 grains were nitre, and 1.5 nitrate of mercury, derived from the ill-made fulminate. By boiling again in water this passed into a yellow subnitrate.

7.2 grains of insoluble matter were brushed off the dried filter, and heated with dilute muriatic acid. The solution being thrown on a filter, this retained one grain of carbon and sulphur, while 6.2 grains of fulminate of mercury passed through in the state of a birchloride. The proportions of this match-powder must have been, therefore, eight grains of a kind of gunpowder, and about eight of indifferent fulminate of mercury, and yet it exploded very well; it obviously contained more nitre than usually enters into gunpowder.

The proportions deduced by the French Commissioners, from their elaborate and able researches, are ten of fulminate and six of pulverin (gunpowder meal).

One hundred grains of fulminate, triturated with a wooden muller on marble, with thirty grains of water and sixty of gunpowder, are sufficient to mount four hundred detonating caps.

In describing the formation of fulminating mercury, I omitted a curious fact that lately occurred to me. Desirous of moderating the reaction of the mixture which had been overheated, I added a little alcohol from time to time, till its quantity was increased by nearly one-half. The fulminate being washed, and laid out on the filtering paper in the air when nearly dry, minute brilliant points were observed to start up on different parts of its surface, which, becoming larger, where found to be globules of mercury; this metallization went silently and slowly on till nearly one-half of the powder disappeared; an ethereous hydro-carbonate was evidently the agent in this unexpected reduction*.

EMERY CLOTH.

The SILVER ISIS MEDAL *and* FIVE POUNDS *were presented to Mr.* T. LOWTHORP, 25, *Crescent Street, Euston Square, for his Emery Cloth; Samples of which have been placed in the Society's Repository.*

THERE is an immense consumption of sand paper and of emery paper, both in private families for cleaning furniture and utensils of iron and steel, and still greater in manufactories of hardware of all descriptions. But paper is so brittle that it will not hold together after having been used a little while, and, unfortunately, this happens just when its quality as a polisher is the best, from the coarser grains of sand or emery having been rubbed off.

By substituting the cheapest kind of calico for paper, the candidate has produced an article, the durability and utility of which far exceed the additional cost required by the substitution of cloth for paper.

The sand, pounded glass, and emery, are to be sorted by washing over in the usual way, and then are to be dried for use.

The calico best suited for this purpose should be thirty-two inches wide, of a strong even thread, but not too coarse, and which has been as little dressed as possible. It is to be put into stretching frames two yards long, and, after being wetted with warm size, is to be stretched to a width of thirty-six inches. The size em-

* To the relative conservative powers of different gunpowders, my attention was first drawn by my very intelligent friend, Major Mooday, Commanding Royal Engineer of the Government Gunpowder Works; and through his co-operation I hope to be able, in another paper, to prosecute this subject, so interesting in a national point of view.

ployed for this purpose is composed of 2lbs. of good glue, dissolved in six quarts of warm water, and then mixed with two quarts of water that has previously been boiled with half an ounce of alum; and six ounces of good wheaten flour. The mixture is to be put over the fire in any convenient vessel, and, when it begins to bubble, is to be poured out into a pan for use.

On the dry calico, still in the frame and stiff with the coating of size, is to be laid on another coat of a stronger size, made by dissolving 4lbs. of glue in three quarts of warm water, and adding one pint of the first size, together with an ounce of gum arabic and an ounce of gum tragacanth.

While this strong size is yet wet, the emery, sand, or glass-powder, is to be sifted on as evenly as possible, and the calico is again set to dry, and is afterwards brushed, to remove the loose particles: a second coating of strong size is then to be laid on, and is to be covered with another layer of sifted emery, &c. It is then again to be dried and brushed, and is now ready to be removed from the frame, and cut up into sheets for sale or for use.

MINER'S LAMP.

The SILVER ISIS MEDAL *was presented to Mr.* J. ROBERTS, *Queen Street, Cheapside, for his Adaptation of Reflectors to the Miner's Lamp invented by Sir* H. DAVY; *one of which, so fitted, has been placed in the Society's Repository.*

THE principal objection to the use of Sir H. Davy's safe lamp is the feeble light which it gives, in consequence of the flame, which is not large, being enclosed by a cage of wire gauze; and this defect is greatly increased when, as often happens, the miner is at work in air mixed with so much inflammable gas or carbonic acid, or a mixture of both, as to occasion the lamp to burn with a pale smoky flame. The explosion which, in such circumstances, would probably take place, is, it is true, prevented by this admirable invention; but any means by which the light of the lamp could be increased, or at least rendered more available to the miner, without impairing its safety, would greatly add to its utility. Each miner has, or ought to have, his own lamp; of which the only part of the light that is directly useful to him is that which falls on the spot where he is working: it is obvious, therefore, that if a reflector were placed behind the flame, much of the light that otherwise would be lost may he thrown to the precise part where it is wasted. The reflector employed by Mr. Roberts is of no regular curve, but approaches to that of the concavity of about a third part of a cylinder: it may be made of copper silvered or tinned, or of planished tin-plate, which is not only the cheapest, but, on the whole, the best material, as being far less liable than silver to tarnish by the contact of sulphureous vapour.

In certain collieries, where the beds are thick, as at White-

haven, and in the ten yard coal of Staffordshire, the miners are often required to work in the upper part of the galleries, where fire-damp is very liable to collect, and where a lamp, even with a reflector, immersed in this inflammable air, will give but little light. For such cases Mr. Roberts employs a second concave reflector attached to the outside of the lamp by a jointed rod; which enabling it to turn in any direction, allows the miner to place the lamp on the ground where the air is the purest, and consequently where the flame is the brightest, and, by adjusting the exterior reflector, to direct the rays condensed by the interior one to the place where the light is wanted.

Trial has been made of Mr. Roberts's apparatus in a colliery near Bolton, the under-looker of which reports that, by means of it, a degree of light, quite sufficient for every purpose, may be obtained at a distance of from fifteen to twenty yards from the lamp.

Mr. Roberts, who is a practical coal-worker, stated the following circumstances to the committee, which, though not directly connected with the subject of the preceding notice, may perhaps, without impropriety, be recorded.

Signs of the presence of inflammable air in a coal mine are, when the flame of the candle or lamp has a blue top, the length of such blue top being an indication of the proportion of inflammable air, and therefore of the hazard. This blue top is sometimes two and a half inches long; and when an explosion is imminent, it begins to dance on the top of the proper flame of the candle.

Signs of the presence of carbonic acid gas are, when the candle burns dull and finally becomes extinct, previous to which the flame becomes smoky, is somewhat enlarged, and the least agitation of the air will put it out.

Signs of the presence of the mixture of both the above-mentioned gases are, when the flame has a long broad bushy top, sometimes six inches high; the flame is then, in Staffordshire, said to be *fire-fangled*. In these circumstances no explosion takes place; but if the proportion of carbonic acid increases, the flame goes out.

Those confined parts of a colliery which are imperfectly ventilated, and which, when cold, cannot be safely entered with a candle, cease to be so hazardous when warm. In such places the miner first enters without a light, takes off his jacket, and shakes it about to stir the air, and then falls to working with all his might till he is in a profuse sweat, in order that the place may get warm: he then steps out as quick as possible for his light, lest the place get cool: it is now safe as long as the miner continues hard at work; but if he ceases even for a short time, the inflammable air shews itself by the blue top to his light, and the place becomes hazardous. If he leaves the place for a short time, he must re-enter it without a light, and with all the precaution above-men-

tioned. After a miner has heen thus working, the vapour, as the place cools, will stand in drops of dew on the surface of the coal.

The efficacy of the above proceeding seems to depend, in part, on the carbonic acid produced by the breath of the miner, but chiefly on the aqueous vapour of his excessive perspiration; in confirmation of which Roberts found, while working in the coal mines of Whitehaven, that he obtained immediately the same advantage by throwing down before him a lump of quick lime and pouring water on it.

Dr. Clanny's safe lamp depends on the same principle of diluting the gas with steam.

LIST OF NEW PATENTS SEALED.

PRINTING.—To R. Winch, of Gunpowder Alley, Shoe Lane, for improvements in printing machines.—Dated 29th January, 1831.—Specification to be enrolled in six months.

SUGAR.—To J. Bates, of Bishopsgate Street Within, London, for improvements in refining sugar. Communicated by a foreigner.—31st January, 1831.—Six months.

MUSIC.—To J. C. Schwieso, of Regent Street, Middlesex, for improvements on piano fortes and other stringed instruments.—2d February, 1831. Six months.

LACE.—To W. Sumner, of Hose, Leicestershire, for improvements in machinery in making lace.—3d February, 1831.—Six months.

SPINNING.—To G. G. Gardner, of Threadneedle Street, London, for an improved roving machine. Communicated by a foreigner.—11th Feb. 1831.—Six months.

FIRE ARMS.—To W. W. Richards, of Birmingham, for improvements in the touch-holes and primer, suitable to percussion guns, pistols, and all sorts of fire-arms fired upon that principle. 11th Feb. 1831.—Two months.

GLASS, &c.—To J. Gunby, of George Street Sand Pitts, Birmingham, for improved methods of combining glass with metals, or other substances.—11th February, 1831.—Two months.

WEAVING.—To C. Guillotte, of Crispin Street, Spitalfields, Middlesex, for an improvement in the rack applicable to the battons of ribbon weaving machinery.—11th Feb. 1831.—Six months.

STEAM ENGINES.—To W. Morgan, of York Terrace, Regent's Park, for improvements in steam engines.—14th February, 1831.

TYPE.—To J. Thomson, of Spencer Street, Goswell Street Road, Middlesex, for improvements in making printing types.—14th February, 1831.—Six months.

LACE.—To T. Bailey and C. Bailey, of Leicester, for improvements in machinery for making lace.—15th February, 1831.—Six months.

PEDOMETER.—To W. Payne, of New Bond Street, for an improved pedometer for the waistcoat pocket.—15th Feb. 1831.—Two months.

TO OUR READERS AND CORRESPONDENTS.

We are under the necessity of postponing the communications of Mr. Gompertz, Mr. Hooper, and all others, until our next number, which will be the commencement of a new volume, and have a more extended circulation.

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END OF VOL. V. NEW SERIES.

DIRECTIONS TO THE BINDER.

Coe, Printer, 27, Old Change, St. Paul's.